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FEBRUARY 1940

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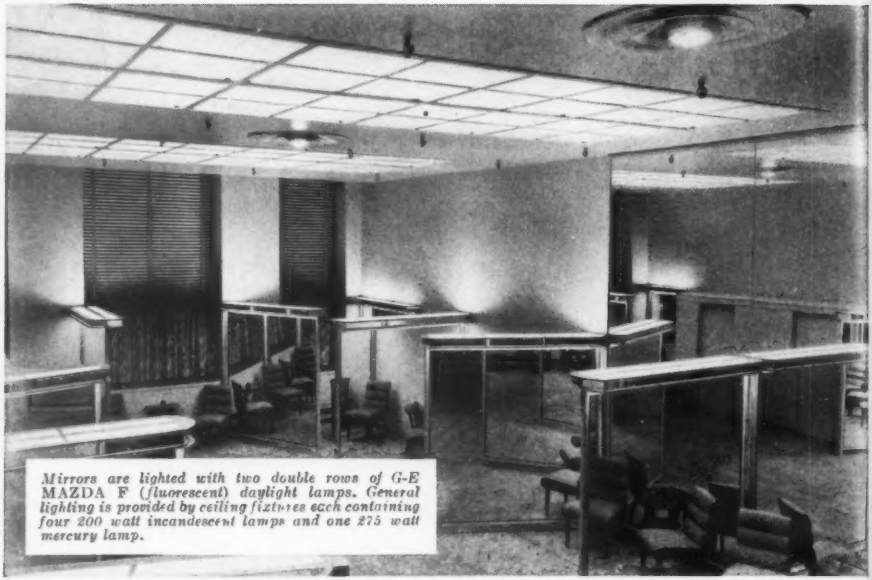

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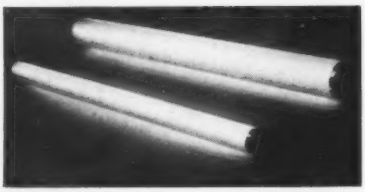

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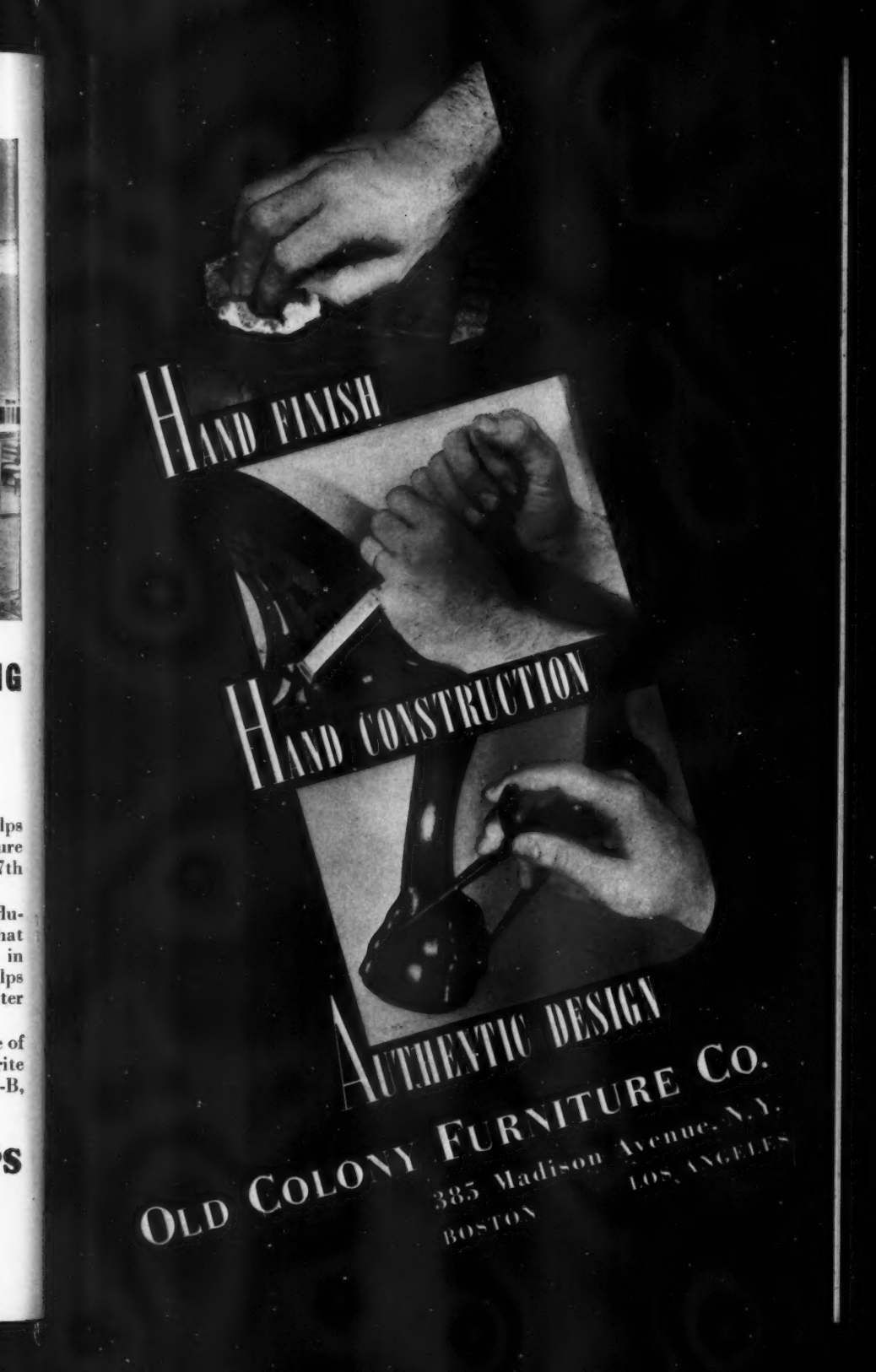
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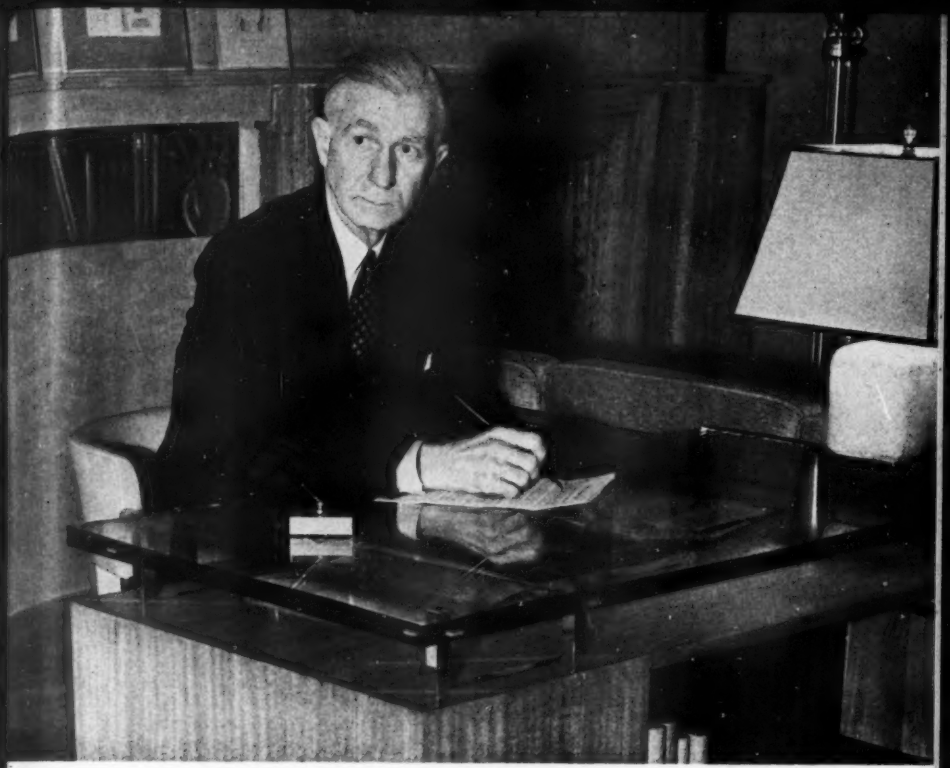

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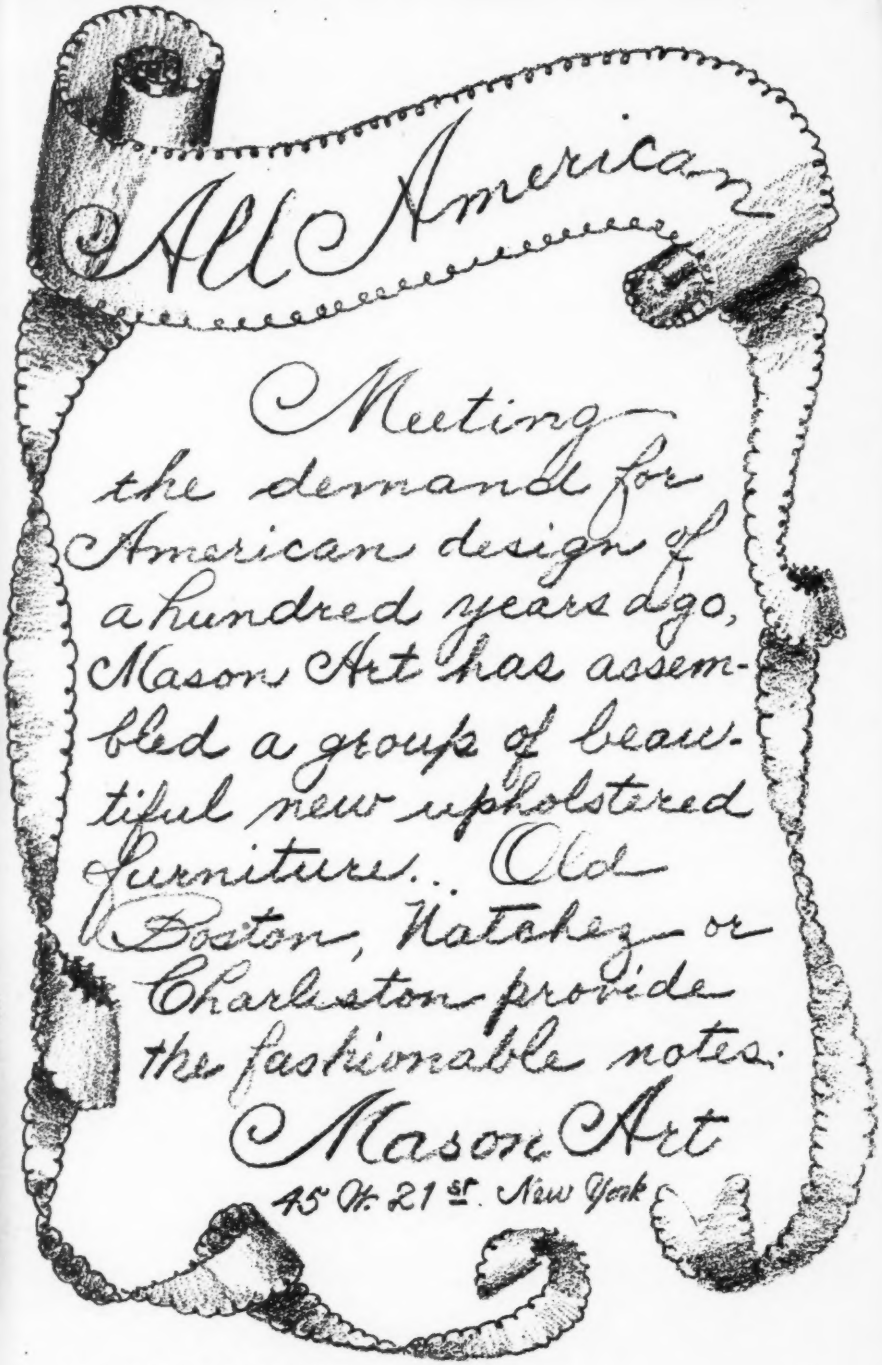
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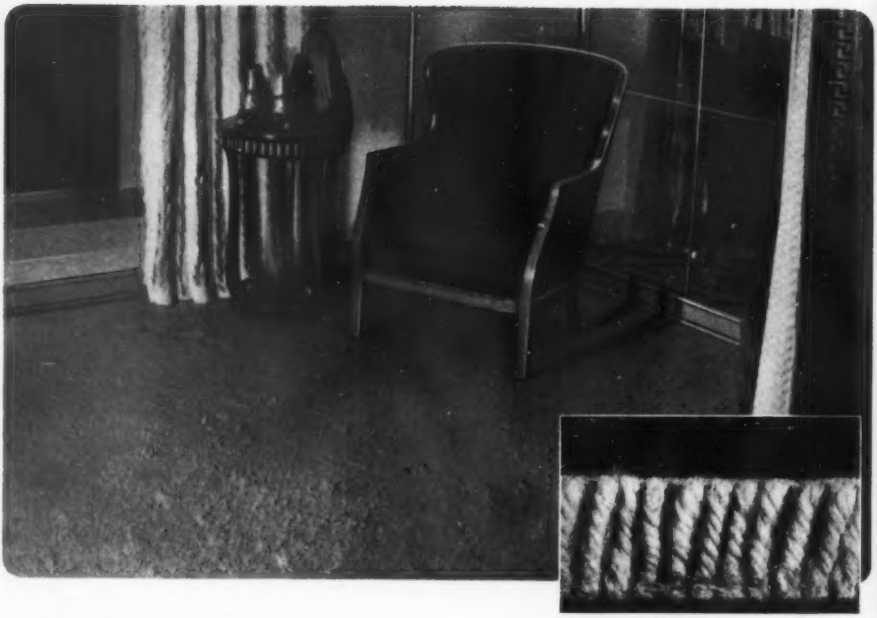

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* * * The new marbleized fabric designed by William Pahlmann and executed by Scalamandré. RIGHT: As used by Mr. Pahlmann in an interior for Lord & Taylor. BELOW: An enlarged section of the fabric showing greater detail.

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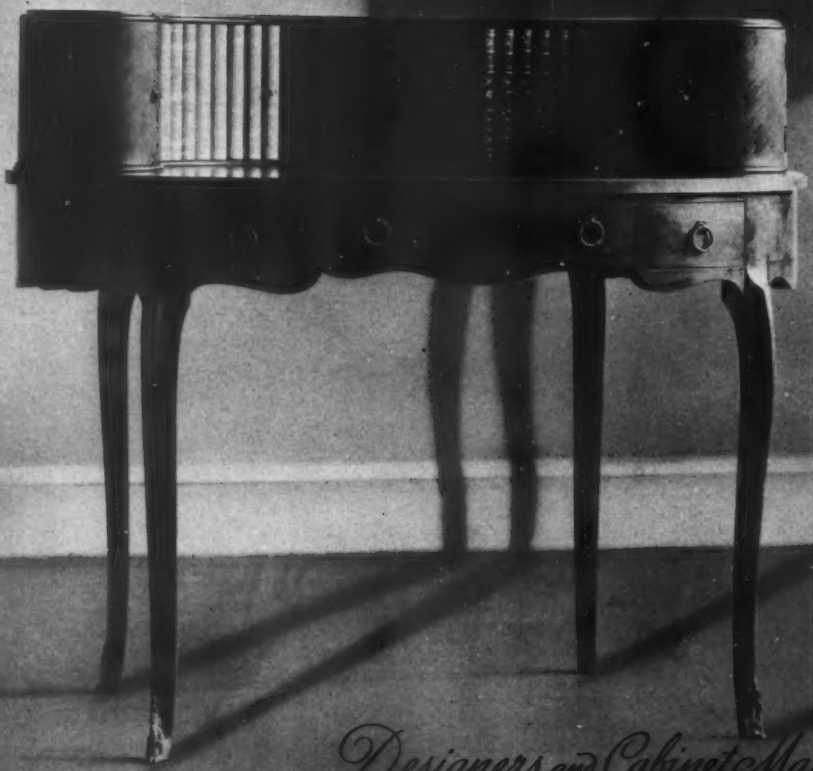

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INTERIOR DESIGN

AND DECORATION

THE DECORATORS DIGEST

Harry V. Anderson, *Publisher*

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DESIGN OBSOLESCENCE

We are prone to think of obsolescence purely from the point of view of efficiencies. A highly efficient article today becomes obsolete tomorrow when new efficiencies have been wrought by mechanical improvements.

It has been the acceptance of obsolescence by manufacturers that has made America the highly industrialized country that it is today. However, due to our increased culture the manufacturer has another form of obsolescence with which to contend: it is Design Obsolescence.

It seems extremely difficult for some manufacturers to associate the same ominous meaning in obsolescence to design as applied to the mechanical aspects of their products.

The automotive and refrigerative industries, and more recently railroad transportation are outstanding examples of how manufacturers have profited because of their appreciation of design obsolescence. A willingness to accept design obsolescence and a will to correct it have made these industries notably successful.

Of the industries whose success lies to a great extent in the fine interiors that are being created, the clock industry is an outstanding example of a total lack of a realization of design obsolescence to the success of its products.

Bearing out this observation is the fact that interior designers throughout the country are decrying the lack of suitable design in clocks. Perhaps the fault is due to the fact that the leading manufacturers have been too content in the realization of the mechanical perfection of their product. Nevertheless clocks are not in every room of our abodes today as they should be, and the deterrent has been solely the lack of suitable design.

At this writing we are aware of a movement to revitalize the fine tradition of clocks in the home, the basis of which is design.

When this movement gets under way let us hope that it will supply the impetus for similar activity to the radio and lighting fixture industries.

Harry V. Anderson

PLASTICS UTILIZED IN STORE INTERIORS

Every modern store should represent a compromise between efficiency and attractiveness—the technical requirements of selling and the artistic responsibility of the interior designer. But to design and plan a department store is to do more than merely provide for its accommodations and customers. The policy of the store must be considered, and the interior designer must determine whether the designing is to be according to accepted taste—as the customers desire it—or as a means of influencing taste.

Of recent years, with the popularity of the Modern style and its freer renditions *sans epoch*, the development in design has been so advanced that the interior designer has had to eschew the customers' preferences for his own less static ideas. The modern department store has thus become an important interpretation of new materials that are in the market, and this fact may have far-reaching effects, both culturally and economically.

It is a refreshing privilege therefore to view a newly completed department store in which the best principles of interior design are represented. Such capable professional ability is evidenced in the new Saks Fifth Avenue store, in Los Angeles, recently completed by Tom Douglas, Interior Designer.

There are three notable qualities about this imposing store which set it apart from other stores in which the customer has had less consideration: first, the store presents décor of primary importance for interior designers interested in dramatic treatments in Modern mood; second, the resulting effects are correlated in a manner calculated to best enhance the sale of merchandise; third, it is impossible to view the interior design of this store and not discover the original uses to which new materials

The dramatic use of plastics which Interior Designer Tom Douglas has made throughout the Saks Fifth Avenue store is evident in the beautiful try-on tables and balustrade of the Millinery Salon. Catalin is used for the hand-rail and transparent Lucite for the balusters.

in the market—particularly plastics—have been put. These new products are full of interest and are now available to every interior designer capable of employing them in individual and distinctive ways as here exemplified.

The store is unique in that the interior designer has achieved a wholly new background for merchandising. The photographs offer conclusive argument in favor of the spectacular treatment which Mr. Douglas decided upon as the *raison d'etre* for his commission, which, after all, is a specialty department store for patrons of taste who appreciate—and desire—quality of design lavished upon their surroundings even while shopping. The most marked feature of the decorative scheme is a total absence of any department store or commercial atmosphere. Although the store is one of the largest and most important establishments in California, the effect is that of a series of small but distinguished French shops.

A notable consideration of the interior designer has been the adaptation of architectural elements, such as columns, niches and varying ceiling heights, indeed even the shapes of the various rooms themselves, to enhance the interior design. Color treatments employ light walls and ceilings, but any tendency to monotony is counteracted by the more intensive hues in furniture and objects d'art.

Another striking thing about the new Saks-Fifth Avenue store is the major emphasis that has been placed on original lighting treatments, both decorative and efficient. The general lighting, characterized by a complete absence of glare, is in the form of flush, recessed ceiling fixtures and indirect cornice lighting that imparts a soft, pleasing illumination. Supplementary lighting is supplied by shaded lamps and illuminated niches and recessed panels.

The outstanding room on the first floor is the Millinery Salon, with its design de-

The Custom-Made Gown Floor is characterized by mirror panels extending from floor to ceiling. The fireplace is framed by Baroque acanthus leaves finished in silver leaf that are most effective with a breche d'Alep marble facing. The flanking Louis Quinze quarter-round sofas are tufted in a textural citron fabric.

Shown below is a view of the Debutante Millinery Department with its shield-back upholstered chairs, and try-on tables and mirrored niches trimmed with satin festoon draperies.

rived from Empire sources. The floor is covered with pale gray carpet, the walls are a slightly deeper tone and the ceiling even darker. All try-on tables are made of crystal-clear Lucite plastic, with legs carved in a twisted candystick design; the chairs and sofas are of black lacquer, upholstered in rough raw silk of a peculiar grayed-yellow color. Enormous old French apothecary jars of crystal, mirrored to resemble old lusters, and black and silver urns filled with coral flowers have been placed atop tall black fluted Empire columns set in niches. The somber, classic background is ideal for the smartly styled varicolored hats displayed here in their full beauty.

The second floor, where imported and custom-made dresses and furs are shown, is divided into a series of large oval rooms. The same décor is used throughout, and is distinguished by a color scheme of water-gray in varying tones for carpets, walls and ceilings; the hangings are aquamarine, and upholstery materials, used with pickled fruitwood or antiqued silver frames, are of the same aquamarine color or pale grayed citron. Expanses of structural mirror panels create a delightful illusion of increased spaciousness that enhances the Baroque effect established by the elaborately carved fireplace surround which Mr. Douglas brought from Vienna especially for this room.

All the doors in this room have been framed with *pavés* of Lucite plastic and topped with acanthus leaf pediments of the same glass-like material.

The third floor has been designed for the debutante or college girl, and the treatment is more frivolous and very feminine. The theme is Modern-Victorian, and the scheme is developed in eucalyptus green and terra-cotta.

It is a noteworthy fact that all the furniture throughout the Saks-Fifth Avenue store, with the exception of a few Viennese antiques introduced for accents, was designed and built in the shop of the interior designer, and the entire furnishings, including the handsomely finished draperies and upholstery, were accomplished with California craftsmen. The fine designs in plastics were fabricated by Dave Swedlow Corporation. Indeed the store throughout exemplifies interior design that is simple, dignified and beautiful, combining as it does new materials and techniques with the old.

The smartly designed sofas shown above, in the Restaurant Foyer, are upholstered in strong green and white striped satin that is most effective.

On the opposite page is the entrance to the Millinery Salon, showing the Modern effect realized by the combination of engaged columns, circular niches and fine classic moldings.

A corner of the Custom-Made Gown Floor appears at the right with its tortoise shell console, specially designed lamp and shaped wing chair.

A satisfying lived-in quality has been attained throughout the series of rooms by the use of pleasing color, interesting fabrics and a fine sense of the appropriate in combining decorative furniture of several related historical periods. Watson & Boaler, Inc., Interior Designers.

INTERIOR DESIGN FOR MEDIUM INCOMES

Livable interiors with fine furniture can still be designed at a low price. That is the convincing idea behind *Town House,* a group of attractive rooms recently opened by Watson & Boaler, Inc., Interior Designers, in North Michigan Avenue, Chicago. The series of rooms is entirely furnished with reproductions of antique furniture with Modern designs by Albert Hagmayer.

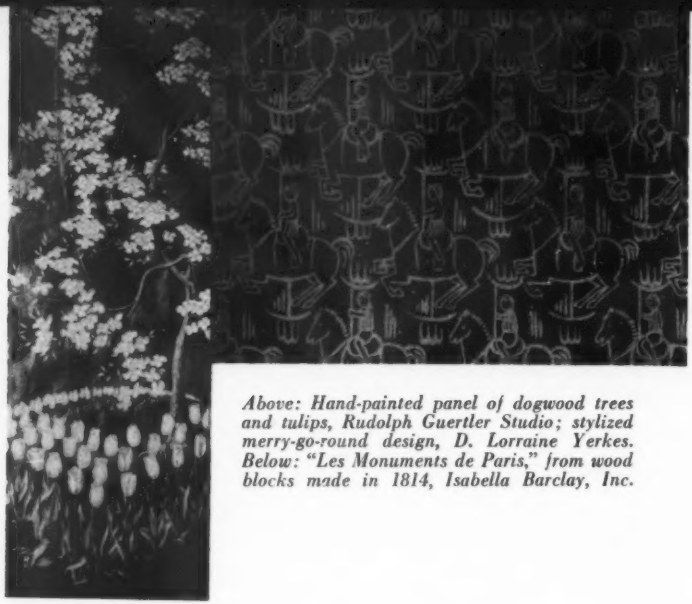
Although the whole idea was the outgrowth of the plan to display the furniture to its best advantage, the various rooms have been developed into an interesting expression of modern achievements in interior design. For instance, stimulating contrast is highlighted in the foyer, where a bold, baroque framed mirror is set against glittering gold metallic papered walls. Smoky antiqued mirror strips, black lacquer doors with tortoise shell paper panels add to the effect created by the striking décor, while acid-green velvet benches on a white marble floor serve to heighten the contrast of color.

The living room is in subdued olive green, with variations of deeper and lighter greens accented with melon pink and geranium red. These same colors are repeated in the unglazed English chintz covering a pair of low arm chairs and in the brilliant water color, *Birds of Paradise* by Beneduce, hung over the mantel. Amber-toned mahogany and natural waxed pine characterize the reproductions of English antiques which are combined with the 18th Century mahogany color for accent. Draperies and covers are in monotone damasks, and terra-cotta leather on a pair of beech chairs adds another strong note of color.

One of the distinguishing features is the use of large photomurals of porcelain figures, depicting the four seasons, which appear as a wall decoration in the dining room. Against melon-pink walls above a rich red-brown dado, these murals present an effect as pleasing as it is classic. A definite note of formality is established by the simple pseudo-architectural expedient of framing openings and defining wall spaces with flat pilasters crowned by a classical wall paper frieze below a blue ceiling, indirectly lighted. The furniture reflects the exquisite detail and the fine design of the English Regency, but is executed in light mahogany. A textural satin is used for the upholstery of low, rounded back chairs, while the side chairs have striped satin seats. A breakfast table with a square marbleized top mounted on a metal urn pedestal base, shallow half-oval consoles with swan supports, plaster candelabra and a gilt wood chandelier add interest.

One of the finely executed bedrooms combines a French provincial background with Modern furniture. The wall paper, draperies, bedspreads and upholstery are satisfactorily developed in the same motifs and colors. In another, and equally attractive, bedroom are reproductions of 18th Century originals in darker mahogany, used with a handblocked English chintz used to drape one entire wall.

The dominating item of furniture in the book room is a handsome secretary, a copy of an old Biedermeier piece. An American variation of a Modern fabric from Sweden covers a pair of comfortable chairs, while a brilliant green imported English chenille textile is used on a corner settee. Among several small tables is one with brass wire detail stretched between tortoise shell disks that is fetchingly Modern. The unusual Danish rug completes the picture.



Above: Hand-painted panel of dogwood trees and tulips, Rudolph Guertler Studio; stylized merry-go-round design, D. Lorraine Yerkes. Below: "Les Monuments de Paris," from wood blocks made in 1814, Isabella Barclay, Inc.

WALL PAPERS PREVIEWED

Individual, creative designs for wall coverings, original with the interior designer and made exclusively for his client, have been successfully launched and are undoubtedly headed for even greater expansion. It opens many new avenues of design and allows a greater expression of the client's own taste, providing each member of her family with a suitable background for each personality.

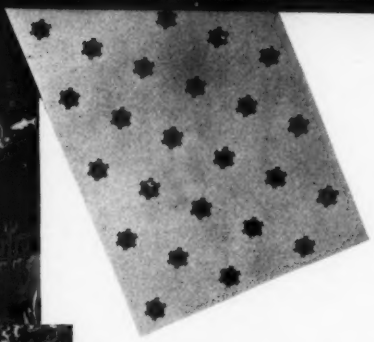
Wall papers and fabrics, printed from the same rollers, make a pleasing combination when used in the same room or when the motif is duplicated elsewhere about the house. A particularly fine example is a chintz pattern which is good as a fabric, yet makes a charming wall paper as well, and will please the most fastidious client. A group of designs which have a decided

Clockwise: Antique and Modern borders with accompanying moldings, Bassett and Vollum; "Rustic Toile" available on gray, cream, yellow and blue grounds, Imperial Washable Wallpapers; "Mississippi", with typical river views of the period, The Warner Co.; "Leander" with bouquets and swags, in 24-inch width, Richard E. Thibaut, Inc.; thistle and rose pattern taken from an English mirror frame, Katzenbach and Warren; jabot design in pastel or darker tones. F. Schumacher & Co.

effect of hand-blocking, present the added feature of interchangeable motifs so as to relieve the monotony of too much pattern on one wall; in which case the plainer background can be used alone or the central medallions used without the small patterned background. The use of a great many colors was formerly limited to only the more expensive papers, yet there are now several to be found that incorporate multicolored combinations which are exceedingly rich in appearance yet are moderately priced.

Of the novelty papers, tweeds and plaids are favored on the plainer types while ostrich plumes and bow-knots or a pack of playing cards make up a gay pattern on others slightly less conventional. Book paper is too thin to use in large quantities, and it requires a great deal of care to apply, but

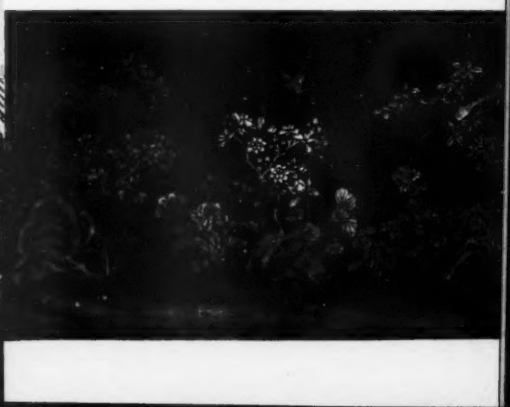
Top row: Floral clusters on draped background, Sigfrid K. Lonegren, Inc.; hand-painted floral in twenty background colors, Charles R. Gracie. Second row: Striking plaid design in harmonious colors, Artcraft Wallpaper Co.; "American Fancy", circles-and-squares, adapted from old document, Jones & Erwin; "Diana", a Modern wallpaper for foyer or powder room, A. H. Jacobs Co. Inc. Bottom: Jacobean pattern in deep peacock blues on pale yellow, Thomas Strahan Co.



it has been used in a most unusual small foyer where its marbleized effect has caused a considerable amount of comment.

There still continues the increasing demand for hand-painted murals, either imported or done in our country by those who have an appreciation of the art. Tulips form a circle about a dogwood tree on one panel done recently; others are merely the graceful rococo scrolls of the Louis XV period made into panels; or scenes from a favorite sport. And no matter how fragile they may appear in colorings, they can be safely washed. Even hand-painted Chinese scenics are now being reproduced with amazingly good results; one interpretation has a bamboo pattern in white on a robin's-egg blue ground with salmon-buff drawing. Scenes of old New York show lower Manhattan when a trip above Canal Street seemed much like a journey to the outposts. And photomurals, which continue to increase in use, are correctly summed up by the explanation that "they bring the world without to the wall within." Especially are they fine for recreation rooms where each sport can be shown in action. A special lacquer spray is now used to protect the surface. And the scenics taken from old engravings can now be used on outdoor

Top row: Marine scenic in two sections, 40" wide, The Schmitz-Horning Co.; small medallion motif in gold on white ground, The Birge Co. Directly above: Vignettes surrounded by ivy vines, Becker, Smith & Page, Inc. Below: Hand-painted Chinese scenic with figures, H. Leo Gould; several panels of a hand-painted scenic design, A. M. Sachs.



terraces, or on garden walls where a perspective is needed to extend the view.

Well designed and attractive borders have previously been limited in production, but the past few months have brought a number of diversified styles in both period and contemporary designs, and also a definite revival of the antique borders. A strawberry design comes in the natural colorings as well as other luscious color combinations: a diamond pattern, one of a roped effect and two versions of a swag are also news of great importance this season. Taken from a circus tent, a striped paper has a scalloped border decorated with ball fringe, and for colors—there can be none more appealing than mist and turquoise with a rich oxblood fringe or pink and white with soft French blue trim. Other borders show a greater lavishness in design, as seen by a Victorian plaid festoon with matching base, a parchment scroll and a Louis Philippe swag to mention just a few of the outstanding wall papers this season.

Directly below: Photomural enlarged from snapshot and set in wall panel, Kaufmann & Fabry Co. Bottom row: Green bamboo stalks and yellow birds on white ground, United Wallpaper Co.; Zuber scenic showing part of one section, "The Zones", A. L. Diament & Co.

A PORTFOLIO OF ADDRESSES AT THE NATIONAL CONFERENCE ON PLASTICS SPONSORED BY INTERIOR DESIGN AND DECORATION

DESIGN PRINCIPLES APPLIED TO PLASTICS

BY WALTER DORWIN TEAGUE

Plastics represent a very large part of the enormously expanded resources that we have at our command today for the building of a saner and better world. You know, we live today in a curious inaccuratism, a rather tragic and sardonic inaccuratism. We have within our reach the most gigantic means for the betterment of human living that the world has ever known, the most powerful fund of knowledge to be applied to that problem. You have all the facilities for the building of a Utopia, where life can be lived serenely, with dignity, with full opportunity for all men to expand their possibilities and realize their potentialities. And, on the other hand, we have this wave of madness which seems to be sweeping over a large part of the globe and threatening us all with destruction before we have time to make use of this knowledge and apply these resources with which we are possessed.

I cannot feel that the insanity of war that threatens the world is any more than a temporary aberration. It is so contrary to all the trends of human development. We are not really a self-destructive race. Our profoundest racial instincts are on the side of order and beauty, if you want to call them that, and righteousness in the world.

When we came out of the ancestral tree tops we had very poor equipment for making our way in the world. We were probably more poorly equipped than any other animal. We had no very dangerous fangs or claws. We hadn't much speed nor great strength. We had spotty and inadequate fur. We had no poison except the verbal poison that we have developed in the course of time. But we did have one very basic resource, a unique asset. It just happened that we came from a race of animals which had five fingers, and one of these fingers neatly and accurately opposed each of the other four. There is the whole secret of our civilization and our advancement. Our hands are the most cunning instruments that nature has ever devised.

We started at a very early period in our history to use those hands—because the hands alone were not particularly effective. And as Spendler said, the hand needed a weapon in order to become, itself, a weapon. So we started by picking up stones. And we began to choose stones that were adaptable to holding in the hand, a stone that had a large round end on one side and a more or less sharp cutting end on the other. We found those were more effective in breaking bones than the others. Then we found when we tied a stick to a stone, we got more leverage.

That was the spirit of craftsmanship that was born in those early men, because it was so necessary that the things they did should be efficacious, that they should be practical, that they should serve their purpose. So they were spurred on constantly to greater feats of skill, and skill, itself, became an aim of the race, a desideratum of all mankind, something to be admired. And things skillfully made were a source of endless pleasure.

That feeling for skill has been maintained in the race and developed constantly through the centuries; and we today are feeling a

great resurgence of that spirit of craftsmanship. However, it was temporarily confused and dislocated by the enormous revolution of the industrial age. This race of ours has only gone through two major revolutions: One was when we gave up gathering our meals off the trees and chasing them on the hoof, and settled down to raising them in one spot. That was the agricultural revolution. It began many thousands of years ago, and it still isn't complete in many parts of the world. The second was the industrial revolution, when we substituted the machine and mass production for the ancient handicrafts. That began only a hundred and fifty years ago, and it has been more drastic and more complete in its scope within those territories where it has been perfected than even the agricultural revolution.

It is quite logical that these last hundred and fifty years should have been a period of great turmoil, of great disorder. The world had pursued its business and done its work in very much the same ways, century after century. The handicrafts were largely static. They progressed very slowly. Then all of a sudden this tremendous cataclysm descended upon the world, and instead of weaving our cloth by hand, we found we could do it by machinery, by power. We found we could develop machines for working steel, for working wood, for doing practically everything that had previously been done by hand. And instead of small industries and cottage industries and home industries, factories developed and spread their black blight over vast stretches of England and America, and Western Europe.

It was a devastation worse than the devastation of the last World War. People suffered from the early stages of the industrial revolution more than any people have ever suffered from war at any time. There were generations that were wilted and practically wiped out. It was because we had new techniques to learn, we had to acquire new skills. And for a long time we were clumsy in the use of those skills. We were experimenting, we were trying, we were testing. And we were fumbling and making a very high percentage of mistakes.

As a result, we not only built ugly cities and ugly towns, impracticable dwelling places, but we devastated the country, itself, wiped out beautiful green countrysides and replaced them with slag heaps and ash dumps and those terrible scabs that cover the surface of most industrial countries.

We are now beginning to emerge from that. We are beginning to feel again a mastery of our tools. Machines have acquired tremendous precision and a beautiful degree of control.

Now that we feel that mastery surging back, this command of our tools, we begin to look around us with disapproval at what has happened to the world in the last three or four generations. And we begin a tremendous job of reconstruction. It is a heartening thing, if you give your attention to the constructive work that is being done in the world today, instead of destructive work; if you look into the chemical laboratories, the research laboratories, the engineering laboratories, if you see what the designers and the architects, the city planners, the housing planners, etc., are doing. We are beginning to recover those things which the world designed for decent human living. We are doing this not only because of our command of tools, but because of the enormously increased range of facilities which are at our command, which we have available for our work.

Plastics are only one of those materials, and yet an enormously important one. The same design principles apply to plastics that apply to any other form of design. There is no compartmentalization in design; you apply exactly the same principles to the design of a plastic lamp, let us say, as to the design of a national capitol, or an ocean liner. And we feel again, a deep interest, a profound, analytical interest, in these methods that we must apply in the

making of the things that we have to do. We have this world to build. We have our towns to reconstruct. We have our highway systems, our transportation systems, to reconstruct. We have a whole environment to rebuild. And we begin to ask: "How are we going to do it? What is our approach to these staggering problems that confront us?"

We see examples all around us of this new order emerging. We see magnificent achievements such as the Triborough Bridge and its approaches, such as the dams that have been built by the Tennessee Valley Authority, and its powerhouses, in Tennessee. We see achievements such as Boulder Dam. We see some of the new and modern factories, beautiful steel and crystal palaces, in which work is no longer a degredation, in which work is recognized as being fraught with dignity.

And we wonder what it is that all these structures have in common. Well, so far as they are successful, they are all based on, first, a study of the function of the thing that is being done. And that, again, is just as true of a plastic inkwell as of a vast housing development.

We must ask ourselves, first, "What is this thing for? What use is it supposed to serve?" And we will find that our design gains distinction just in proportion as we adapt the product to the purpose it is supposed to serve. We will find that we are only echoing in that respect the processes of nature, itself. The beauty of a race-horse, for instance, is in its adaptation to speed, its long and slender legs, its deep barrel-chest, its light build, its vibrating muscles, its fire and animation. The beauty of the human body is derived from its adaptation to its function as an animal. And we find the respective beauties of a male and female derived from their adaptation to the respective male and female functions.

That goes through all nature, this beauty arising from adaptation to a purpose. And so, in our own products, as we adapt them more exactly to the purpose for which they are meant, we find beauty and order emerging from them. You can see this in the development of airplanes which has taken place almost within the lifetime of practically everyone here, and in the development of motor cars you can see gradually this adaptation of functional form producing beauty and unity of simplicity in the products.

Then there is a second factor that must control us in all our design work, and that is the adaptation of the form to the materials that we expect to use. Our steel bridges take an entirely different form than our concrete bridges. Our plastic products take a different form than our wood products or our metal products. And it is only as we study the material, itself, that we find it has in it possibilities of beauty that we hadn't realized. We made no decent metal furniture until we began to design our metal furniture as metal furniture and not as imitations of wood furniture. One of the things which has held back the development of plastics, and which we have got to overcome, has been the fact that plastics were first introduced almost always as imitations of something else, as substitutes for something more expensive.

Plastics are not substitutes; they have virtues of their own. And those virtues must be realized and developed.

We have a natural reluctance toward assimilating anything new or different. Herbert Spencer said one time that "Primitive man deviates into novelty only by imperceptible variations." Now, in those polysyllables he described all of us. We are all primitive in that sense. We deviate into novelty only by imperceptible variations. And so it is rather difficult for us to take a completely new material and realize its possibilities. It must be subject to long and careful study before we begin to see the characteristics emerge which it has and which are not possessed by other material.

Then, again, we must consider the techniques that are used in the fabrication of a product and of a material. The techniques

are the marks of the tool which always must appear on anything well done. And there, again, we must know, if we are going to deal with plastics, how they are molded or how they are laminated or how they are extruded, and what can be done with that particular kind of process that cannot be done with other processes. The more individual we make our work in adapting it to its functions, its materials, its techniques, the more distinguished it becomes.

Then, of course, there are certain broad principles that apply to all design work. In creating anything, we seek to give it unity. We seek to make it all of a piece, so that you cannot damage any part or change any part without feeling that the whole has been harmed. Unity has been the goal of all designers. Fortunately, it was analyzed many years ago by the Greeks, who were extraordinarily rational and intelligent people. They discussed the principles of design, and they realized clearly that this achievement of unity in man-made things, as in works of nature, was the foremost aim of the designer. They formulated that, and consequently, everyone has known it since. But we haven't always practiced it, by any means.

However, any bird or flower is a complete little cosmos within itself, if you ruffle the feathers of a bird or tear the petal of a flower, you feel at once that that thing has been injured; it is no longer complete. Our own work should achieve that sort of unity. And within that unity, we have to create a variety A billiard ball has unity. It has a certain amount of common interest—great interest at times. But esthetically, its interest is very soon exhausted. It is like a parade of policemen; they run very true to form, and after the first hour or so it becomes a bit tiresome—you begin to wish that they would ring in a few soldiers or street cleaners by way of variety.

If there is one thing that we dislike more than disorder, it is boredom. And, consequently, in the things we do, we must introduce a certain vitality and inspiration that gives a thing life and gives it that changing aspect that we require in anything that is wholly satisfying.

I think that by far the most beautiful things we make today, our greatest artistic masterpieces, are our transport planes. They are perfect examples of adaptation to function, to necessity. The materials and techniques are used correctly. A beautiful unity has been created within their forms—the rhythmic quality within the lines; the beautiful repetition of line and form throughout them. And yet, those planes have an endless variety of aspect. You can see them flying overhead or landing at the airport or as you fly alongside of them in another plane. They present a thousand different appearances, and the play of line is never tiring.

It is that type of close-knit unity, with great interest and vitality and variety in form that we seek for. In creating this unity today, we naturally achieve a high degree of simplicity, because we are a primitive people. We have reverted again to a primitive state of human development. We are primitives of this new machine age. We have no developed history behind us to use in our artistic creations. We have no theories, no vocabulary of ornament, to use in our work. We can deal only in elemental forms. That is why so much of our modern work today has a certain spark and simple quality that relates it very closely to the primitive work of Greece and the primitive work of Egypt and the primitive work of most people who are discovering their techniques and their tools.

Consequently, our work must be stripped of non-essentials. They only blur and confuse our forms. And we must eliminate anything that is not necessary to the problem in hand. In doing that, we seek, however, to create relationships between these forms, between the lines, between the elements of the things with which we are dealing. We seek to integrate those things which repeat certain characteristics.

You know, we are more susceptible to rhythm than to almost any other emotional

influence. Our hearts beat rhythmically; we are subject to the rhythms of nature, the changing of the seasons, the alternation of night and day, the waxing and waning of the moon, the rising and falling of the tides. All nature moves in a rhythmic flow. Our lives have that character. Our sexual experience has that character. We are subject to innumerable rhythmic influences, and we respond constantly and most vitally to rhythms. And when you see a badly ventilated room, at three a.m., filled with curiously gyrating bodies, you can realize that those people are merely following a very basic impulse to put themselves in harmony with the music of the spheres. It is true—"I got rhythm; you got rhythm."

And in our physical work, we have to create that sort of rhythmic relationship. In music, it is comparatively easy to do, because the sequential character of music lends itself to rhythmic structure. Your intervals are presented to you in a procession in music. And that is why music is perhaps a more highly developed and exact art than the art of design. In the art of design, your elements are discharged at you in one place, as it were, and you have to sort them out and appreciate their relationships by your own analysis of the design. Fortunately, however, our eyes are so constructed as to aid us in doing that. We have presented to our consciousness a broad field of vision, which is present to our consciousness but which is not seen distinctly. A movement in any one part will attract our attention to it. We turn our eyes in that direction. But actually there is only one very tiny portion of our eye that sees accurately, and when we look at a thing we turn two little searchlight beams on the thing we look at. We feel the thing over with those two fingers of vision.

If a design is properly made, the designer has created certain accents which attract your attention, which give you the key, that is, the motive, of the design. From that you will be led out through the relationships quite unconsciously, but will begin to see the thing, if you look at it intelligently and analyze it, as a composition, as a collection of relationships which are significant. That is what we mean by rhythm of design.

In achieving that kind of rhythmic relationship, we have of course resources of proportion, which is one of the most important factors. We must establish constant ratios of proportion in our work, and with it we also have the quality of line, which we find most highly developed, let us say, in a Douglas transport plane, where you see the same type of form repeated in the engine and in the fuselage, in the wings and the tail—the same line recurring again and again; that long line with a sharp parabolic curve at the end, which we have come into the habit of calling "streamline."

Now, one reason why we are streamlining so many things today, things which will never move and have no excuse for being streamlined in the sense that they need to be adapted to the flow of air currents or water currents, is simply because of the dynamic quality of this line which occurs in streamline forms, and it is characteristic of our age—this line that starts with a parabolic curve and ends in a long backward sweep. You will see that recurring in many modern buildings, in all types of modern vehicles, and in many products, as I say, that will never move out of one spot.

That is as characteristic of this time as Hogarth's line of beauty was characteristic of his age. Hogarth was subject to the tastes and prejudices and preferences of his time. That double curve of Hogarth's, his ruffled foreline, is graceful, but weak; it has no figure, it has no strength; it is merely a gracious, beautiful, wavering line.

We do not respond to that at all. We are a primitive age, a dynamic people, and we respond only to the expressions of tensions, of vigor, of energy. And this line that I speak of that occurs in streamline forms, but may also occur in many forms that are not intended to move at high speed, just as it occurs constantly throughout our bodies—a muscular male body or a beauti-

fully formed female body—is made up almost entirely of lines of that character. They express certain tension and vigor with which we today are in sympathy, dynamically. We have these resources of proportion of line and color and form, but we have no ornament. And we should be very careful to deny ourselves the luxury of decoration in the things that we do, because we have no decoration today that is significant to us, that has a meaning. The Greeks, in their great day, in the design of the Parthenon, had at their command a vocabulary of ornament that they had inherited through years of work, that had become significant to them and was very useful in the creation of their internal rhythm.

But when we have taken care of this question of accent, to guide our eyes through the analysis of a design, to assist us in seeing it, when we have created a scale within that design, holding it all within one scale of proportion, when we have given it balance and symmetry—and by symmetry, I don't mean that the left side should duplicate the right; I mean that it should be integrated and that there should be an analogy between all its parts—then we must go further and give it something else. We must breathe into it a breath of life that comes only from the designer. And the designer cannot acquire that by study. He is born with it, or he never has it. He may have it at one time of his life and not at another. But it is a vitalizing force that comes out of the designer, and which generates life in the thing that he is doing. Without that, a design remains an inert—competent, but inert—and uninspiring work.

If we succeed in doing those things—if we can create a simple unified form, adapted to its use, to its materials, to its technique—we have given that thing inevitably a style that is characteristic of this time. We need never worry about style. We should never think about style. The minute we begin to think consciously about the style of what we are doing, we find that we will be diverted into digressions that have nothing to do with the case.

This last century has been far too conscious of style. And we are only beginning to recover from that consciousness. Authentic style is only found in a work that has been done seriously to serve its purpose, to express its materials, its techniques, and in which a high degree of unity has been achieved through the rhythm of proportion, uniformity of scale, proper use of accents, and a high degree of sympathy.

This style that we are creating today is inevitably, as I said before, a primitive style, because we are a primitive people. It is very simple. We deal in elemental forms, and our work has an elemental character. But it can have great dignity and great distinction.

I feel that more and more people are becoming conscious of these principles of design and are beginning to apply them to the work we are doing today. That is why we see these magnificient highway achievements emerging, these beautiful parkways that go out through the country. That is what a road should be. A road is not merely a means of getting from one place to another. It is a means of getting pleasantly from one place to another. And all roads should be adapted to that purpose. There is no reason why we should be subjected to indignities and disorders at any stage of our lives, and certainly not on the highways.

As these design principles are being applied to housing, for instance, we see oases of order and dignity emerging in the middle of squalid slums; we see life again being restored to a level of serenity and fruitfulness; and we see all around us more and more concentration on this problem of reconstructing an environment in which all of these principles shall be expressed—so that once more we can live in this world with our heads held high and with a sense of freedom and an opportunity to accomplish whatever our small powers may enable us to do.

PLASTICS IN THE REALM OF FURNITURE

BY D. S. FREDERICK, Ph.D.

Furniture is designed to perform a useful function, and also to beautify the room in which it is located. Plastics have proved both useful and beautiful. Wood, the material which has been most widely used in the manufacture of furniture, possesses beauty, strength, and the ability to be readily fabricated into many shapes. The majority of the plastics also possess these properties. In fact, in plastics we find a wider range of colors, designs, and possibilities of fabrication than we do in wood. Plastics are available in shades from clearest crystal through pastels and tints to deep shades of blue, brown, and black. They require no protective coatings or finishes, and their color is uniform throughout. Designs of various colors or mottles may be stamped on the surface or may extend throughout. Plastics may be fabricated with the tools ordinarily employed in working wood or soft metals, and in addition they may be compression or injection molded. Plastics which soften at elevated temperatures, the thermoplastics, may be formed into curved intricate shapes merely by heating and bending on a form or jig. Plastics may be cemented or joined by mechanical means. Thus we see that plastics possess all the properties which have made wood satisfactory as a furniture material, and in addition offer further advantages which make them well adapted for use in furniture.

The plastics which are being employed in furniture may be divided roughly into two classes; first, those which are used in bonding materials other than plastics, and secondly, those plastics which are used alone in the manufacture of furniture. In the first group, we find materials such as the phenolic and urea resins, which are employed in bonding wood, paper and fabrics. A well-known phenolic material used for this purpose is Tego Glue Film. An urea resin widely used for bonding purposes is Uformite. Materials bonded with these plastics are fabricated into various forms. In these applications the resins used, to a large extent, replace previously employed adhesives such as animal and vegetable glues. The advantages of these synthetic bonding materials are that the bonds are stronger, more permanent, more resistant to moisture, and in many cases more resistant to insect pests such as termites. Wood is a material with so many desirable properties that its use in the past has been almost universal in the furniture industry. By its nature, wood itself was not easily subject to scientific improvement, but a definite corrective step was made several decades ago with the general introduction of plywood. Plywood represented primarily a mechanical rearrangement of the wood fibers and stresses, and offered mainly a mechanical improvement. However, it also introduced the further defect of decreased durability at each glue joint. When plywood was first manufactured, the available glues, vegetable, starch, albumen, blood, and casein, were all subject to deterioration on exposure to moisture and mold, allowing the plywood to disintegrate.

The phenolic resins used in this application are applied either in the form of solutions or as impregnants on paper. The solutions are applied to the wood surfaces, and the layers of wood then bonded in a

hydraulic press under heat and pressure. In the use of the impregnated paper materials, the paper is cut to size, interleaved between the wooden veneers, and the bond established in a hydraulic press. When these bonded panels are removed from the press, they are completely welded together and ready for subsequent sawing, sanding, and finishing operations. Plywood manufactured by this method offers the advantages of performance, non-aging, waterproofness, strength, decay-proofness, heat resistance, and uniformity. The bond is actually stronger than the wood itself. It resists mold and fungus, which feed on other adhesives, and also imparts resistance to the adjacent wood due to its phenolic character. Curved plywood shapes may be manufactured by using curved platens in the press in which the veneers are bonded. In the preparation of plywood with the urea resins, the process is similar to that used with the phenolics.

Of course, the uses of resin-bonded plywood are well known to everyone. This material is used in furniture of all types, in doors, wall panels, automobile, airplane and truck bodies, trays, boats, and radio cabinets.

Another use of resins in connection with wood in the manufacture of furniture consists of impregnating thin veneer sheets with various types of resins, weaving these sheets into the desired pattern or design, and then combining the woven sheets under heat and pressure. This material is known as Parkwood. This process enables the production of unusual and attractive designs, as wood of various textures and colors can be readily combined. This woven wood is used in the manufacture of furniture and is also being employed for such applications as luggage, book bindings, and wall paneling.

Urea and phenolic resins are also employed in bonding materials such as paper and fabrics, to form panels employed in doors, table tops, wall paneling, bars, counter tops, signs, lighting fixtures, and drawer fronts. These laminated panels, among which are Formica, Micarta, and Lamicoid, are generally attached to a metal or wood backing to provide rigidity and to prevent warping.

Among the plastics which are used alone in the manufacture of furniture are the acrylics, the cast phenolics, and cellulose acetate. Molded phenolics, such as Bakelite and Durez, are used to a limited extent for handles and drawer pulls. It seems probable that acrylics, which include Plexiglas, Crystalite and Lucite, will find the widest use in furniture due to their intrinsic beauty, strength, and the ease with which they may be fabricated. The acrylic resins are basically colorless and transparent, possessing a sparkling brilliance which can be matched only by the most expensive glass, As they are thermoplastic materials, they can be formed into curved shapes by heating and bending over comparatively simple forms. They can be sawed, turned, drilled, sanded, and polished with the equipment ordinarily used for hard woods or soft metals. They can be readily cemented with strong joints. Of course, due to the transparency of the material, it is necessary for the joints to be perfect as they are visible. Due to their basic freedom from color and resistance to discoloration, the acrylic resins can be supplied in an unlimited range of shades and tints. They are at present available in the form of rods, sheets, tubes, and molding powders. To date, rods, sheets and tubes have been used most widely in the manufacture of furniture, as the employment of molding powders involves the use of expensive molds. Items which have been made from the acrylic resins include beds, chairs, lamps, decorative screens, benches, drawer pulls, and shelves. In some instances, they have been employed merely as a replacement for wood, whereas in other cases, advantage has been taken of the properties of these materials to produce items which could not be readily made from wood.

The ability of the acrylic plastics to transmit light around curves makes it possible to illuminate furniture by the use of hidden light sources. Carved edge-illuminated screens are also made from the acrylic resins.

Cast phenolics, including Catalin, Marblette and cast Bakelite, are suitable for use in furniture to a more limited extent, due to the fact that they have a tendency to discolor and become more brittle upon aging. Furthermore, they are not so readily fabricated as the acrylic resins. They can be formed to a limited extent by heating, and can be machined. They have been most widely used as drawer pulls, handles, arm rests, and decorative objects.

Cellulose acetate, sold under the trade names of Lumarith, Plastacele and Tenite, has been employed to a certain extent in furniture, but its use is limited due to its tendency to warp and due to its flexibility. It is quite tough and can be readily machined. However, it lacks the crystal clarity of the acrylic resins, and is not available in sheets and rods as large as the acrylic materials. It has been used mainly in novelty applications such as transparent chair backs and piano cases. Thin cellulose acetate sheets are employed rather widely in the manufacture of lamp shades. Molded cellulose acetate knobs and handles also find considerable application.

Decorative accessories, although not generally considered as furniture, are classified as furnishings. All the plastics previously mentioned, as well as the various molding powders, are employed in the manufacture of accessories. You are doubtless familiar with these materials in lamp shades and bases, cigarette boxes, desk sets, clocks, table ware, place mats, table center pieces, and decorative screens. For some of these items where a large number of identical pieces are manufactured, the plastic molding procedure can be used economically.

COORDINATING PLASTICS WITH LIGHTING

BY MAURICE H. BIGELOW, Ph.D.

There are several types of plastics available to our present designers and these are, roughly, divided into four classifications, i.e., thermosetting resins, thermoplastic resins, cast resins, and laminated resins.

Urea formaldehyde plastics are made by impregnating extremely pure white alpha cellulose with urea formaldehyde syrups. For this reason, although the simple resin itself, is water-white in color, urea plastics are not available in a transparent form but are available as white and translucent. Because urea plastics do not change their shape when subjected to heat, they find their chief use in the manufacture of molded diffusors, designed to direct the lumen output of incandescent Mazda lamps. This thermal stability of urea plastics is not the only reason why they are of major importance in lighting. From the standpoint of light diffusion and light absorption they are superior to materials previously used in the lighting industry.

Urea plastic diffusors control the light flux distribution and the degree of diffusion by two distinct means, the combination of which exists in no other common lighting material. The quality and degree of dif-

fusion is controlled by the alpha cellulose particles which are an integral part of the plastic. Since this cellulose material is not composed of spheres but rather irregular elongated particles, because the resin itself appears to be a colloidal gel, the degree of light diffusion is exceptionally high and remains so irrespective of what mechanical changes may occur during the molding of the plastic.

It is essential in the manufacture of a semi-indirect luminaire that three factors be considered. First, it is essential that the luminaire is highly efficient. Secondly, the reflector must not appear too bright; and thirdly, it must harmonize with the surroundings with which it is employed. Because of the high diffusibility of urea plastics and the low light absorption, it has been found that urea plastic luminaires are more efficient with no evidence of filament fire and the brightness values are very low. It is possible to control the lighting characteristics of urea diffusors ranging from luminaires having a low light transmission to those having high transmission. At the same time it is possible to balance the amount of light reflected from the luminaire so that in most instances the overall efficiency remains the same. This balance is accomplished by adding to the urea plastic during its initial formative stage certain specialized pigments. The balance between reflected and transmitted light is, therefore, controlled independent of the degree of diffusion by simply opacifying the plastic with suitable pigments.

While it is possible to adjust the light distribution ratio, it is also possible to control the color of the light transmitted through the luminaire. It is essential in good lighting practice in certain instances to have warm fixtures; that is, the light coming through should have a certain yellow tone. This is particularly important for residential usage. However, there are occasions where this warmth of color is objectionable, particularly where the reflector is to be used with the newer type of highly reflecting ceilings. There have been produced within the last year certain urea compounds which, when lighted, have a daylight color. This daylight color is restful to the eyes in that when lighted the luminaire does not contrast objectionably with a bright ceiling. In considering residential lighting as well as interior lighting for reception rooms and public meeting places, such as hotel lobbies, dining rooms, etc., it is quite frequently desirable to further modify the nature of the light transmitted through the semi-indirect bowls; and in the urea plastics a special color has been developed which appears to have the same color tone whether illuminated or not. In other words, the luminaire harmonizes with the room in which it is hung, both in the daytime and at night. This color modification has been accomplished without an appreciable sacrifice in the efficiency of the reflector.

The use of urea plastics is not entirely restricted to the manufacture of semi-indirect bowls, but due to certain of its qualities, its resistance to shattering and the variety of colors in which it is available it is being used for special lighting, such as is demanded by railway, automotive and naval engineers. In the form of louvers it is now being used in the lighting of new subway developments and the newer streamlined trains.

Urea plastics are available in any color, and for that reason a great many decorative lamps are now available and the interior designer is no longer at a loss because of color inadequacies.

Molded phenol formaldehyde plastics, except in remote cases, are not used in the manufacture of luminaires. This is primarily due to the fact that they are only available in opaque, dark colors and are not lightfast. Phenol formaldehyde plastics, however, are an important adjunct in the lighting industry because they are readily formed into devices for supporting luminaires and other lighting fixtures. While

metal is chiefly used for hangers, husks and other supporting devices, due to their light weight and other qualities, phenol formaldehyde plastics are rapidly entering this field. With a variety of mottles available in the phenolic resins, the interior designer now has at hand plastics which not only harmonize with the furnishings of the room but are very excellent from an electrical resistance standpoint.

Thermosetting laminated plastics, particularly of the urea type and urea formaldehyde protected phenolic type, are finding increasing use in conjunction with the use of Lumiline lamps and fluorescent lighting. With the modern trend toward louver, cove and fenestrated lighting it becomes more and more important that light stable plastics in sheet form and laminated plastics are available. In transportation lighting, laminated plastics in the form of troughs and panels are supplementing urea plastic louvres. Their chief advantage lies in the fact that they have good diffusion and fairly high light transmission, and in lighting, such as is usually met with in railroad cars, a redistribution of the light is available without having objectional high and low lights throughout the length of the car.

Cast resins offer certain advantages over other plastics in that at the very outset no expensive steel molds are necessary. Further advantages of this type of resin is that a large variety of mottles may be made by simply stirring into the syrup prior to casting traces of coloring agents. Because the resin itself is quite transparent, marble, onyx and other similar effects may be simulated. Cast phenolics, therefore, become the logical material from which lamp bases and standards may be manufactured, displacing the heavier castings formerly used. A drawback to the use of phenolic cast resins is that they are not lightfast and have a tendency upon aging to develop a yellowish cast. This, however, is not really objectionable because the change is so gradual that it is hardly noticeable to the eventual purchaser of fixtures made of cast phenolics. It does, however, restrict the use of the material where it might be used to redirect the lumen output of the lamp because this change in color would be sufficient to reduce the overall efficiency appreciably.

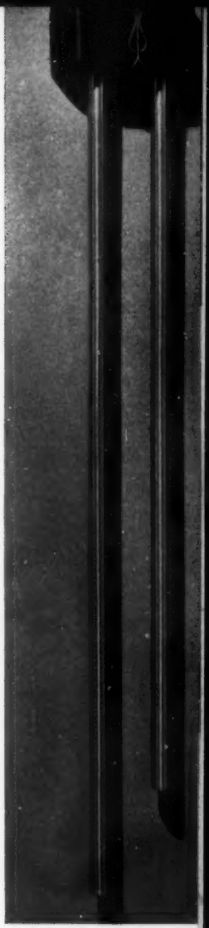
Thermoplastic resins are readily formed into sheets by simple pressing or extrusion operations and are available in a large variety of thicknesses, ranging from transparent to rather opaque densities. Such sheets may be readily used for the manufacture of lamp shades and compete with the present parchment and silk shades. These sheet materials, particularly when made of cellulose acetate, vinyl acetate or methacrylate resins, are lightfast and since they have smooth surfaces are readily cleaned, thereby adding to the life of the shade. Of course, they may be readily used in conjunction with silk trimmings and other decorative devices.

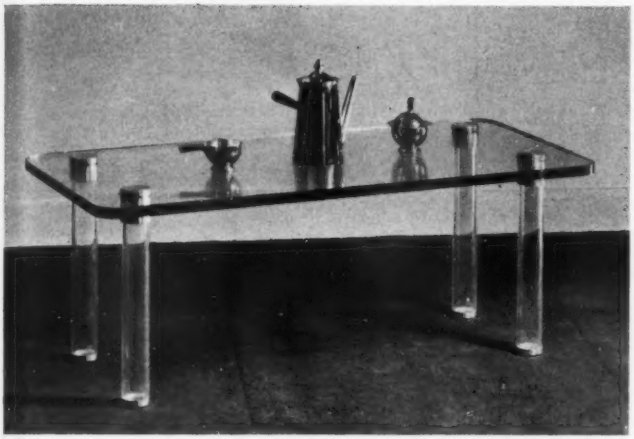
In general, thermoplastic sheets are available not only in translucent whites but in mottles and colors as well, giving the designer quite a latitude of materials with which to work in designing reflectors.

Reflector Bowls: Semi-indirect luminaires are now available in plastics, ranging in diameter from 6″ (for use with 60 to 100 watt lamps) to 27″ (for use with 1000 to 1500 watt lamps). The more desirable plastic for use in the manufacture of such bowls is the urea formaldehyde type. The temperatures developed by the Mazda incandescent units rule out the use of thermoplastics. Color instability of the phenolics eliminates their consideration, except in the case of totally indirect units where the reflector bowl may be a composite of two plastics, the interior surface being made of highly reflecting urea formaldehyde plastic and the exterior of the phenol formaldehyde type. While there are no reflector bowls of this type commercially available at this time, it is conceivable that they will be forthcoming.

Continued on page 59

Door knobs and switch plate of molded Tenite will neither chip nor peel. They are molded in variegated colors. Tennessee Eastman Corporation. The door chimes, at the right, are housed in an attractive walnut Bakelite molded case. Bakelite Corporation





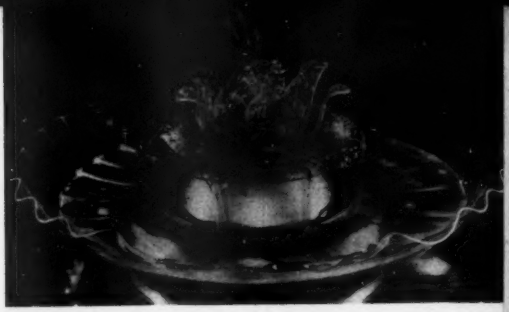
This Modern coffee table with plate glass top and Lucite, E. I. du Pont de Nemours & Co., Inc., legs was designed by Gilbert Rohde for Herman Miller Furniture Company.

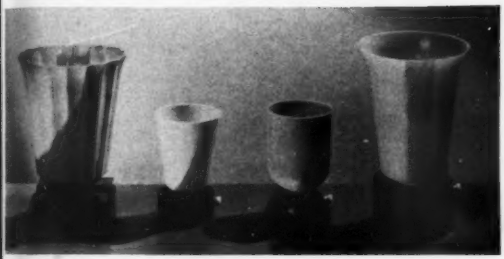
Handsome library steps shown at the left are fabricated of Plexiglas, Rohm and Haas Company, by Swedlow-Lehman, Inc. The telephone of molded Tenite, Tennessee Eastman Corp. is manufactured by Stromberg Carlson.

Against a background of synthetic fabrics shown at the Conference were a Formica table, Formica Insulation Company; a smoke-tone pigeon of cast phenolic designed and fabricated by Breading Furst; and a Catalin inlay piece in two colors by H. E. Hymer.

Synthetic and coated fabrics were featured displays at the Conference. Among the types exhibited were: Eastman acetate rayon, Celanese rayon, Vinyon, Pliofilm, Cavalon, Fabrikoid, coated chintzes, Koroseal, and Spectrafilm, viscose rayon and Bemberg.

The Crystalex electric fountain sparkles with beauty and is practically unbreakable, Louis P. Weil. The crèche figures below are produced from Bakelite transparent cast resinoid. Original sculptures by Louise Cross. Robinson Galleries, Inc.





Decorative scales fabricated of Lucite, E. I. du Pont de Nemours & Co., Inc., are from Swedlow-Lehman, Inc.

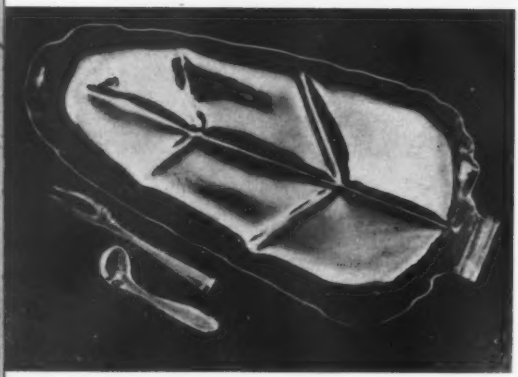
Occasional lamps of Plaskon, Plaskon Company, are shown at the left.

Lighting reflector shown at left is made of Beetle, Beetle Products Division, American Cyanamid Co.

Both the shade and the base of the lamp shown at the right are made of Lumarith, Celluloid Corporation.

**Lighting device on page 43 is made of Plexiglas, Rohm & Haas Co., Inc., by C. K. Castaing.*

Crystalex containers are delicate in appearance, but durable. Louis P. Weil.



Crystalex is used for this ribbed hors d'oeuvre dish, pick and spoon. Louis P. Weil.

Fanciful sea life has been interpreted in clear Lucite by Don Manning. E. I. du Pont de Nemours & Co., Inc.

Plastacele table mats come in a variety of motifs and colors. The Lehmans.

Continued from page 54

Urea plastic luminaries offer the advantages of being light-stable, light-weight, tougher than glass, shatter-proof and unaffected by rapid temperature changes. Further than this, their light output remains unchanged with use, and since their dimensions do not change from piece to piece they may be used in multi installations with pleasing uniformity; and it is possible to replace a unit at a later date without disturbing this uniformity.

Pin-It-Up Lamps: Until the advent of the urea reflector bowl the very popular pin-it-up lamp was more of a decorative item than a true lighting fixture. With the light-weight 6″ diffusor bowl available now, pin-it-up lamps and similar portable wall lamps are available, combining scientific light control with a high utility factor. The millions of such lamps which are sold annually bear out this contention. Due to the close proximity between the incandescent unit and the diffusor bowl the urea plastics are the only ones suitable for this application.

I. E. S. Lamps: With the rigid specifications set up by the Illuminating Engineering Society for the purpose of developing a scientific reading lamp, it has been possible to mold 8″ and 9⅜″ diffusor bowls not only adequately to meet these specifications but to exceed them by a desirable margin. Here again the heat effect is such as to rule out thermoplastic materials. The advantage of using urea plastics for I. E. S. diffusor bowls is that they are light-weight, which allows the lamp designer to reduce the total weight of the lamp, making it a more desirable fixture. In the bridge lamp it is possible to resort to lamps having single horizontal arms and still stay within the tipping standards set up by the I. E. S. At this point it is well to state that plastics may be used for more than just the diffusor bowls in I. E. S. lamps. Further than this, there is no reason why the phenol plastics should not be used to supplement or replace portions of the metal standard. Rather beautiful and highly decorative I. E. S. lamps might be made, using a combination of cast resin bases and molded phenolic standards. At the present time the I. E. S. lamp is scientifically sound from a lighting standpoint and for this reason its popularity is very great.

Occasional Lamps: The demand for occasional lamps is being adequately met by lamp manufacturers who are employing the translucent colored urea diffusors and molded phenol formaldehyde or cast resin bases. It is admitted at the outset that the lighting value of occasional lamps is secondary to their decorative uses, and because plastics are available in such a large number of color tones and shades they are the logical media from which to fabricate such lamps.

Rosettes, Chandeliers and Wall Brackets: In the interests of the Better-Light Better-Sight campaign much can be done with plastics in modernizing rooms lighted by out-moded fixtures. There are a variety of urea plastic bowls and shades which may be clipped directly to the bare bulb, converting the fixture into a more satisfactory unit. And for the kitchen, it is possible to use one of the several types of screw-in semi-indirect bowls.

Fluorescent Lighting: During the past year the manufacturers of lamps have introduced to the public a new source of light, known as the fluorescent lamp. This lamp in its present form is a tubular bulb with two external contacts at each end which are connected to filament type electrodes. These electrodes are so constructed that in conjunction with a small amount of mercury and argon they essentially become mercury vapor lamps, producing within the lamp a high concentration of Ultra Violet radiation. The interior of the glass tube is coated with a chemical powder which is excited by the Ultra Violet light, emitting visible light. These tubes are available with different color characteristics. At the present time

these colors are blue, green, pink, gold, red, white and daylight. They are also available in several wattages and in a variety of lengths. Since these lamps do not employ a hot filament for the actual light source, the heat radiated is less per watt input than that of an incandescent lamp. For example, a 40 watt inside frosted filament lamp radiates 78% of its input, which of course is mostly infra-red in nature. The 15 watt white fluorescent lamp radiates only 47% of its input. This means that for equal lumen output from lighting installations using the incandescent lamp as against the fluorescent lamp only approximately ¼ as much heat is radiated from the fluorescent fixture. Due to this fact it is possible to design suitable luminaires for the fluorescent light using the variety of thermoplastic materials now available. The characteristics of the fluorescent lamp are such that when used for large installations on high ceilings as a rule they do not need luminaires except from an artistic point of view. However, for use in the home or in low ceilinged rooms, the brightness of the fluorescent tube must be compensated and highly translucent thermoplastic sheets or urea resin louvers may be used with considerable advantage and no loss of light.

Cove and Fenestrated Lighting: In modern home construction the tendency of late has been to engineer away from suspended ceiling units and to resort to more nearly indirect lighting in the form of ceiling troughs, wall coves and fenestrations. For this purpose both the Lumiline and the fluorescent light are ideally suited, and in conjunction with such lighting it is evident that some form of continuous plastic reflecting surface is desirable. For this purpose urea and phenol laminated plastics, as well as the various thermoplastic sheets, are desirable and finding increasing use. The designer has only to purchase the raw material in sheet form and by manipulation and proper supporting devices may build it into the requisite shapes.

Transportation Lighting: With the advent of the airplane, streamlined trains, and the general tendency to obtain better illumination and increase the safety factor, engineers are turning to plastics to solve this particular lighting problem. It is objectionable in railroad lighting to have central flush fixtures located above the center aisle of the car, separated by distances of three or four feet; however, in the past, due to the limited amount of electrical energy available for lighting purposes, such lighting has been used regardless of the general passenger comfort. The low light absorption power of plastics has made it possible now to redesign the interior of cars so that when lighted the car not only is comfortable to sit in from an eye-strain standpoint but there is also adequate lighting at each seat. This has been done by using plastic louvers and, in some cases, plastic shells—the latter being used in conjunction with transparent light-directing lenses. This same sort of lighting is used in automotive busses. In the airplane it is essential that plastic lighting fixtures be used if for nothing more than to reduce weight. The large steamships which have been recently commissioned utilize plastics to a large degree. The lighting fixtures are plastic as well as the walls and doors of the salons and state rooms. It has been found that in naval architecture the plastic lighting fixture is much more desirable than glass because it readily withstands the shocks and vibrations encountered, thereby removing the need of dissembling the fixtures prior to maneuvering.

General Aspects of Lighting Today: In a recent survey presented before the Illuminating Engineering Society, it is interesting to note that a large portion of the home lighting field still remains to be developed or modernized. It was pointed out that there is an inadequacy of convenience outlets; that new floor and table lamps are needed; that there is a decided need for new types of ceiling luminaires. Many homes need

improvement with respect to the lighting of laundries and kitchens, particularly with respect to such items as ironing boards and work tables. At the present time the average home uses, roughly, two portable lamps, while the average home should have at least eight such lamps.

More significant than the figures estimated in the survey were the responses to the question, "Are your lighting arrangements satisfactory?", to which 54% replied in the negative, expressing dissatisfaction. Actual conditions existing in the homes of the remainder hardly warranted a favorable expression of satisfaction. In meeting this state of dissatisfaction the lighting engineer and interior designer have in plastics an important tool to really remedy this situation.

PLASTICS FOR FLOOR AND WALL TREATMENTS

BY STEPHEN J. ALLING

Plastics have a definite place in construction as durable finishing materials and are being increasingly used in those locations in a building which must continuously look their best no matter how many gay and boisterous people flow through them. They are used in the lobbies, corridors and public spaces of hotels, theatres, banks and office buildings, are excellent materials for elevator cabs and doors, and offer sanitary, non-absorbing surfaces for hospitals. They are permanent finishes for wainscoting, stair-well and escalator facings in stores. They supply easily cleaned and maintained walls in tearooms and restaurants. They provide light and sturdy ceilings and walls for trains and airplanes. Their moisture-proof and fire retarding qualities recommend them for use on board ship, for bathrooms, staterooms, and for lounges and passageways. Plastics offer smooth, easily taken care of, clean, colorful surfaces for kitchens and bathrooms in homes, and make excellent spot-and water-proof window sills and basing. Plastic tiles provide resilient, durable and colorful flooring materials for all types of buildings.

There seems to be no limit to places where plastics may be justifiably used in buildings and in all these locations plastics can impart an air of dignity and quiet, or an air of colorful gaiety. They are surprisingly flexible. They can be obtained in more than 100 standard colors and designs. They are available in the form of actual wood veneers and are adaptable to any decorative plan and really express individual tastes.

They are clean materials, with smooth, non-porous surfaces which do not chip, crack or warp. They are immune to destructive insects such as termites, and are unaffected by moisture, weak acids or alkalies, alcohol, paint removers or other solvents. In fact, any liquid which will not seriously hurt a person's skin will cause them no harm. They can be easily cleaned and cleaned repeatedly without fear of destroying their finishes.

Plastics are not cheap materials, but they are permanent materials. Materials which will withstand blows and knocks over a period of years and are reasonably fireproof. They are easily installed and when installed require no finishing, for they receive their finish in the factory at the time of manufacture and lend themselves to shop and prefabrication methods.

The adaptability of a plastic material to floor and wall treatments depends upon such factors as its strength, appearance, stability to light, weather and solvents, thermo characteristics, cost and the forms in which it is available.

The strength or toughness of cast and molded plastics is due to the bonding action of the resins themselves and thus they lack the added strength that the sheets of fibrous materials impart to the laminates. Continous abrasive wear will not greatly affect the appearance of the cast and molded group, since they have a uniform consistency throughout. Whereas, the laminates, unless they be of refinishing stock, once their surfaces have been cut through will show the core materials. Nevertheless, the laminates will withstand a great deal of wear as they are made with thermo-setting resins which have a greater surface hardness than the thermo-plastic resins. The laminates are actually harder than marble and have, in fact, the strength of cast iron.

The flexibility of sheet material made from thermo-plastic resins is greater than that made of thermo-setting resins, for the thermo-plastics, when heated, may be bent to any desired shape which they will retain upon cooling. The laminated, thermo-setting resinoids are not similarly affected by heat; however, they may be bent to radii of 6 inches or larger without much trouble. Radii of less than 6 inches are, in certain cases, possible, but in general should be avoided. Laminated materials when bent must be held mechanically or they will tend to flatten out again. Therefore, it is necessary to veneer the material to rigid cores having the desired finished contour, or to hold the material to the desired shape by means of moldings.

The smooth surfaces and great depths of color available in the plastic give them unique, never-before-obtainable decorative qualities. Light colors with high degrees of stability can be produced by the careful selection of pigments and by the use of water-clear resins. Both solid and mottled colored finishes are obtainable in the cast or molded materials. The laminates are made in solid colors, decorative finishes and artificial woods, marbles, linens, etc.

The ability to cure actual wood veneers as well as colors into the surface of the laminates, makes them available in a large range of beautiful wood finishes. A great variety of different woods may be used such as mahogany, prima vera, walnut, lacewood, satinwood, macassar ebony, etc. The veneers may be either flat cut, ribbon cut, quartered, or any of the other types available in woods and may be had in either plain or woven patterns. The stability of a plastic to weather and solvents depends upon its chemical composition. The laminated plastics have a greater dimensional stability than the cast or molded materials and because of this, it is possible to use them in large sheets without the danger of warpage or shrinkage.

Plastics do not transmit heat rapidly. This is the reason for their warm feeling to the touch and why they are not cold like marble or metal. Still other thermo characteristics depend upon the chemical composition of the plastic in question. In general they have, with the exception of pyroxylin i.e. cellulose nitrate, high ignition temperatures and slow rates of burning. These characteristics may be further altered by the introduction of non-inflammable fillers. Most plastics will, however, burn or char if kept in a flame, but few of them actually support combustion.

The cost of plastic sheets depends upon the cost and amount of the plastic binders used, thus a ⅛th of an inch thick solid laminated sheet would cost twice that of a 1/16th of an inch thick sheet. This also explains the extensive use of fillers in the cast and molded materials and why sheets of cast material containing no fillers, such as those transparent sheets made with acrylic resins, are expensive and why laminated materials, built up on a fiber-board

core, are less expensive than the same thickness of solid materials.

Laminated plastics are available in sheets with maximum widths of 3 or 4 feet and lengths up to 8 feet. They are manufactured in various thicknesses, but for architectural and decorative applications the solid sheets used as veneers are generally 1/16th of an inch thick. Laminated panel sheets with fiber-board cores are available in the same sheet sizes as the above, but in thicknesses of 5/32nds and 5/16ths of an inch. Simple molded laminated shapes, such as channels and angles, are manufactured in lengths of 7 or 8 feet.

Cast or molded sheet stock is not available in as large sheet sizes as the laminates. The maximum size of the clear acrylic resin sheets is limited to 3 feet by 4 feet. This is also about the limiting size of the cellulose acetate sheets. Sheets made from the copolymers of the vinyl resins are available in sizes approximately 2 feet by 4 feet. All cast or molded sheets are made in various thicknesses from paper-thin calendered materials to materials ¼ or ½ of an inch thick, or thicker. Molded material, having a high content of filler stock, used for applications such as floor tiles, is supplied about ⅛th of an inch thick and in rectangular sizes corresponding to the sizes of ordinary ceramic tiles.

Plastic sheets of the cast and molded type are beginning to find wide use for floor tiles, a field in which the laminates are unadaptable. These tiles are available today in a great variety of solid and mottled finishes, ranging from light pastel tints to dark tones and shades. They are warm to the touch and feel much softer under foot than ceramic tiles. They are as equally adaptable to wall as floor coverings, and can be applied to any smooth surface with mastic cements.

Laminated plastics are supplied in the form of panels consisting of plastic laminations cured to fiber-board cores and in the form of thin surfacing veneers.

The panel boards of both 5/32nds and 5/16ths of an inch thickness are sufficiently rigid to be used by themselves as wall coverings. They should be held mechanically to the walls by using nails or screws around the outside edges of the sheets. The thicker panels may be applied directly to studding or furring strips, but the thinner material should have a continuous solid backing and preferably be also bonded to the backing with mastic cement. The joints and the means of attachment are concealed by applied metal snap-on moldings.

Thin veneers of laminated plastics should never be used by themselves as wall coverings. These 1/16th of an inch sheets are too flexible and must be bonded to some type of rigid backing. Plywood is excellent for this purpose, provided the top veneers of the plywood are composed on close grained woods. The material must be veneered with casein glue in veneer presses, where it is possible to get even pressures of between 25 to 50 pounds per square foot upon the surface of the sheet during the time it takes for the glue to set. It is always advisable to use a balancing veneer on the back of the plywood panel to equalize the stress created when the plastic is veneered on the face.

The size of veneered panels is limited, not so much by the size of the plastic sheets available, as by the size of available plywood cores, for several plastic sheets may be veneered upon a single large wood core. Laminated plastic veneered panels range from ¾ths of an inch to 1-¼th of an inch in thickness. Curved sections are readily built up by veneering the material to curved plywood cores.

The veneered panels can be applied diectly to studs or furring strips and it is possible to obtain flush joints by splining the edges of the sheets and fastening them to the furring by blind nailing at the joints.

Ceilings can be covered in essentially the same manner used for walls. Here, however,

it is advisable to use fiber-board core materials rather than veneered panels.

Flush panel doors are manufactured by veneering 1/16th of an inch plastic sheets to standard wood door cores, the plastic material being veneered to both faces and all edges of the wood cores. Cut-outs for glass or louver inserts can be made, the edges of these cut-outs being likewise veneered with plastic sheet material. In this manner, the wood core of the doors is completely encased with moisture-impervious laminated sheets and the danger of warpage due to moisture is eliminated.

Baseboards, door and window trim, window stools, pilasters, columns and the like, are similarly made by veneering flat 1/16th of an inch laminated stock to all faces and edges, or to only the exposed faces and edges of the wood cores. U-shaped laminated channels are available which, when veneered to wood cores, naturally eliminate the joint between the face veneer and the edge veneer.

Expensive and costly equipment is not required for the fabrication of plastic sheets as they may be easily sawed, drilled and planned with ordinary hand or power tools.

FABRICS: SYNTHETIC AND COATED

BY HAROLD DeWITT SMITH, Ph. D.

An indication of the close connection between the world of man-made plastics and the world of man-made textiles is provided by the red telephone in the exhibit which is made of Tenite, one of the the molding materials, or plastics. This material is composed of a blend of cellulose acetate, coloring material, and a plasticizer which improves its behavior during molding and its toughness in use. If this same mixture of cellulose acetate and plasticizer (either with or without dye or pigment) is dissolved in a suitable solvent and then cast into a thin layer from which the solvent can evaporate, the result is a transparent film or foil of Kodapak, which is one of a very useful group of materials used chiefly for wrapping purposes or as a glossy coating for fabrics or paper. Again if this same cellulose acetate, this time without need of plasticizer, is dissolved and forced through tiny holes to make fine, soft fibres which can be twisted together into yarns suitable for weaving, the result is a textile fabric such as an acetate rayon ninon or a satin or taffeta material.

In studying these man-made sheets and fabrics, we should keep in mind that the present age of chemicals, of synthetic products, of miracles heralded by the press and the radio is not really a revolution but simply a current phase of the evolution of man's mind and man's skill.

Turning now to the man-made films or foils, we can dismiss the transparent wrapping materials, such as Cellophane, Sylphrap, Kodapak, Ethofoil, and Cellofoil, because while they perform a very useful and attractive function in the field of packaging, they have not yet developed a position of any importance in interior design, principally because they are not tough enough or pliable enough for such purposes. One exception to this is the lamination of thin Kodapak to both sides of a sheet of metal foil which is then cut into very narrow ribbons and used as metal effect threads, for brocaded and other metallic weaves. The products, called Raymet and Rayspun yarns, will not tarnish because the Kodapak protects the metal.

The great American bathroom, and the utilitarian kitchen have both come under the spell of the desire to wed beauty to

usefulness and man has created several plastic materials which are admirably suited to these spheres. Two representatives of such materials are Pliofilm and Spectrafilm each of which is a very pliant, tough material available in transparent or translucent forms and in a variety of attractive colors. It is somewhat rubber-like in nature, but is a true synthetic material which chemistry has created out of the simpler raw materials such as we have mentioned. Both Pliofilm and Spectrafilm are odorless, tasteless, and unusually tough considering their sheerness. They are water and moisture proof and resistant to acids and alkalies, oils, greases, and mildew. Although they melt in contact with a flame, they are non-inflammable, that is, they will not continue to burn. Their thermoplastic quality permits them to be joined by heat. They can also be joined by adhesives or can be sewn by hand or by machine. They should not be dry cleaned, but are readily cleaned either by wiping with a damp cloth or by washing with lukewarm water or with soap and water. Both of these materials are widely used for wearing apparel, such as raincoats, umbrellas, and beach clothes; and in household articles, such as shower curtains, garment bags, aprons, silver and china protectors, and hat and shoe bags. Spectrafilm is preferred for window draperies and shower curtains because its resistance to the deteriorating effect of sunlight is superior to that of Pliofilm.

Another man-made product of this type which will soon be available in the form of transparent white or colored foils is Koroseal. This is also a synthetic plastic, the origin of whose raw materials is in coke, limestone, and salt.

Turning now to fabric coatings, we find that plastics or synthetic resins have been applied to fabrics for a great variety of purposes ranging from synthetic leather to subtle effects of crease resistance or hand or draping qualities in delicate textiles. One example in this field is provided by fabrics which have been impregnated with Koroseal. For example, a shower curtain or drapery material is made by impregnating a sheer silk fabric. It closely resembles in appearance the familiar oiled silk. A linen tablecoth may be coated on one side. These Koroseal-treated fabrics show good resistance to abrasion and are superior to oiled silk because they do not get brittle with age or exposure to sunlight or air nor do they get sticky when wet. If you have ever tried to dodge the clinging contact of an oiled silk curtain while taking a shower you will appreciate that. Koroseal fabrics are water proof and resistant to oils, rubber solvents, acids, and alkalies. They will burn in a flame, but will not support combustion. They are very flexible exceeding even rubber in this respect. They should not be dry cleaned, but are readily cleansed by sponging with water or by washing in rich, warm suds. The hems of curtains or garments can be joined or applique patterns of contrasting colors can be put on the Koroseal ground with the heat of an iron.

The next group of materials which I would like to describe comprises those in which a coating of plastic or synthetic resin is applied to one side of a fabric base to produce a leather-like or continuous coated surface. One example of this class, which was a pioneer in the field, is Fabrikoid. The plastic used here is nitro-cellulose, the same material which, as the molding compound, celluloid, was the "granddaddy" of the plastics industry. This well-known material is obtainable in colors and in surface textures resembling a great variety of natural leathers, as well as in smooth surfaces. It has found wide use in furniture upholstery and in objects of all kinds where leather was formerly used.

Cavalon is a newer development by the same manufacturer designed for heavy duty upholstery such as trucks, autos, theatres, etc. The plastic used in coating Cavalon is rubber mixed with fibre and treated to give great resistance to wear and to cracking or

tackiness under extremes of temperature from 20° below zero to 180° F.

Another material of this class, called Revolite, uses, instead of a cellulose plastic, a phenol-formaldehyde resin of the original Bakelite type. Because the resin of which this coating is composed is inherently pliable and durable, Revolite does not get brittle with age or under exposure to light and weather and, like the films and coatings which we have already discussed, it is resistant to oils, alcohol, water, chemicals, and moths. It is also resistant to heat and will not catch fire from a lighted match or cigarette which may drop upon it. These coated leather-like fabrics should not be dry cleaned or laundered, but can be cleansed by wiping with mild soap and water and when necessary can be ironed on the uncoated side.

Revolite coated fabrics are obtainable in a number of weights and in a wide range of colors, including metallic finishes, such as silver, copper, and gold. They seem eminently suited for upholstery and draperies, for outdoor terraces, game rooms, cocktail bars, kitchens, and bathrooms. Their resistance to stains and to weathering conditions make them definitely superior to natural materials which were formerly used.

Ever since the first chintzes reached England from India in the early 17th century, chintzes have been in favor and, ever sinces these first chintzes arrived on the ships of the East India Company, the lustrous glaze, which was originally produced by the patient beating and pounding of the printed cotton fabric with stones and later by the application of natural starches or gums, has been perishable so that the original beauty and charm of a glazed chintz has shown a disconcerting tendency to disappear in the washtub or even in the dry cleaning plant.

The plastics industry has solved this problem by the substitution of a tough, insoluble synthetic resin for Nature's starches and gums and there are a number of textile finishers who are producing permanent chintzes. One example of this coated type of fabric is called Everglaze chintz. This fabric can be washed or dry cleaned repeatedly without losing its glazed surface. It is not only very fast to light, but also to spotting from alcohol, oil, or water. The glazed surface will not become tacky. In addition to its function in producing the glazed finish, the resin has set this fabric so that its shrinkage during washing is negligible. An unglazed finish of this same type is therefore sometimes used in prints other than chintzes to eliminate shrinkage. Sateen linings are given the same finish so that the assembled curtain will be washable without distortion.

Another type of fabric on which a permanent stiff finish is produced by a cellulose plastic, instead of by the soluble starches and gums, is a marquisette called Staze-Rite which will also hold its crispness and its dimensions through repeated washings.

Before we turn from the subject of man-made finishes to man-made fabrics, we should mention that various synthetic resins are being used in smaller percentages to impregnate the fibres in textile fabrics without coating the fabric or markedly altering its original appearance for the purpose of improving it in one of a number of respects, including resistance to creasing and crushing, resistance to ravelling or slipping at the seams, draping quality, and fullness of hand.

While all of the techniques which we use today for the fashioning of the material articles of our civilization are really descendants of methods which were painfully worked out by our primitive ancestors to satisfy their own wants and their own longing for beauty, the really great fundamental discoveries and inventions on which our culture rests are very few and their origin is lost in the oblivion of unrecorded history. One of the oldest and most important inventions is the loom. The creation of a

structure of good strength and toughness, yet very flexible and supple, by combining of innumerable fine fibres into yarns and interlacing these yarns into fabrics, gave us a technique without which our lives would be devoid of a great deal of material comfort and of an immeasurable amount of esthetic satisfaction.

To illustrate the uniqueness of a textile fabric as a structure of matter, let me revert to the materials which I mentioned in the beginning of my remarks. Kodapak foil, which is a solid, coherent sheet of cellulose acetate, has a certain degree of pliability, but it is far from satisfying our conception of a textile fabric. If we now cut this sheet into strips 1/64 of an inch wide and interlace these strips at right angles to one another, we again get a coherent sheet of approximately the same weight but we have gained considerably in suppleness and, incidentally, have also changed the transparent clearness into a frosty translucence. This Sheentec fabric has been used in modern decoration where a glassy effect was desired, but from the standpoint of suppleness it is closer to the characteristics of horse hair or straw than it is to that of a fine textile. If, however, we take our original cellulose acetate from which the Kodapak sheet was made and spin it into filaments almost as fine as silk and then combine these filaments into yarns and weave the yarns into a coherent structure of approximately the same weight as our Kodapak, we get a structure which is a textile in every sense of the word, strong yet very supple and soft and with a subtle lustre which comes from the reflection of the light from the myriad of tiny fibre surfaces instead of from the plain, mirror-like surface of the Kodapak.

The development of man-made fibres started with a natural desire to imitate silk, the costly fibre whose beauty and elegance in satin and taffeta and velvet was outstanding. During the fifty years since Count Chardonnet first exhibited a few fabrics made of his "artificial silk", the man-made fibres known under the family name of "rayon" have grown in volume to the point where the amount made and consumed in the United States in 1939 is seven times the consumption of silk, and in versatility to the point where they are used in textures which our long heritage of the natural fibres has let us to class as silk-like, cotton-like, linen-like, and wool-like as well as in new and distinctive textures and types which cannot be obtained with the natural fibres.

The newest of these man-made fibres, which we should still think of as a heritage of the long evolutionary development of man's technical skill, are Vinyon and Nylon, two fibres which are composed of synthetic resins made by the same chemical principles by which the plastics are produced. These newcomers are so young that there are no fabrics yet available which were designed specifically for household use.

There are three different processes of making rayon. About 65% of all of the rayon made in this country is made by the viscose process by a number of different companies under such brand names as Crown, Dupont, Enka, North American, Tubize, Industrial, etc. Another process is the cupammonium. This type is sold under the brand name, Bemberg.

The third type of rayon, which is the youngest, but the fastest growing, representing about 30% of the total production in 1939, is cellulose acetate rayon. This is made by five different companies under the brand names, Celanese, Eastman, Seraceta, Acele, and Chacelon.

Because of the differences in chemical constitution, the properties and behavior of acetate rayon and of the other types are quite different and the textile designer utilizes these differences among the rayons, as well as the distinctive differences between the man-made and the natural fibres, to produce the effects of lustre, texture, color, hand, and drapability which you desire in fabrics for interior design. Both viscose and acetate rayon are available in *continuous*

filament form which resembles the form in which silk is produced and in *short fibres* cut to lengths comparable to cotton, linen, or wool, which are then made into yarns on the same machinery used to spin the natural fibres into yarns. These short rayon fibres are known as *staple fibres* and the corresponding yarns and fabrics are known as *spun rayons*. Brand names of staple fibres with which you should be familiar are Fibro for the largest make of viscose staple and Teca for the most prominent make of acetate staple.

The strength of the rayons is ample for most textile purposes. They lie, in general, somewhat below the strength of silk and cotton, but above the strength of wool. When wet, they lose more of their strength than do the natural fibres, but recover it fully upon drying. Acetate is less sensitive to moisture than viscose. For special purposes, such as automobile and truck tires and parachutes both viscose and acetate yarns stronger than silk are being produced.

With respect to lustre, fineness, and length of filaments, the rayons can be "made-to-order" in a range of these properties which is far beyond the range obtainable with the natural fibres. They are inherently white and retain this whiteness under the influence of light and cleansing, whereas the natural fibres have to be bleached and tend to revert to their natural yellow or tannish shade. They are inherently washable as fibres but the washability of a fabric depends much more upon the type of texture and construction than upon the kind of fibre present. They dry clean beautifully and can be ironed like fine silks. The iron should be warm, not hot, particularly in the case of acetate rayon.

The rayons are relatively cheap and this has permitted the introduction of fabrics of charm and beauty into homes which were formerly denied this esthetic satisfaction. The rayons, however, are not popular because they are cheap; rather, they are cheap because they are popular, for the volume production methods of modern manufacturing have lowered costs to an extent which is impossible in the case of the agricultural production of the natural fibres. Just as silk and the other natural fibres are manufactured into a wide variety of fabric qualities from the inexpensive to the costly, depending upon the skill and the care with which they have been constructed and the beauty of style and pattern which has gone into them, so the rayons are in the entire range of fabric qualities.

The pattern and color by which one evaluates fabrics for beauty and the serviceability which one requires for utility are obtained by the innumerable combinations of a relatively few factors in design; namely, kind and fineness of fibre; twist, fineness and combinations of yarns; type of weave, dyeing or printing; and nature of the finishing process.

RESEARCH IN THE PLASTICS INDUSTRY

By H. M. RICHARDSON

Research is a word which has a multitude of meanings, depending on what the many users of it have in mind. To some it connotes the search for, development and perfection of, new substances, methods or devices. To others it may be the inquiry into the how, the why and the wherefore of existing things. And to others it means enlightened, scientific exploration into new fields in search of things which man never knew before and the evaluation of the discoveries

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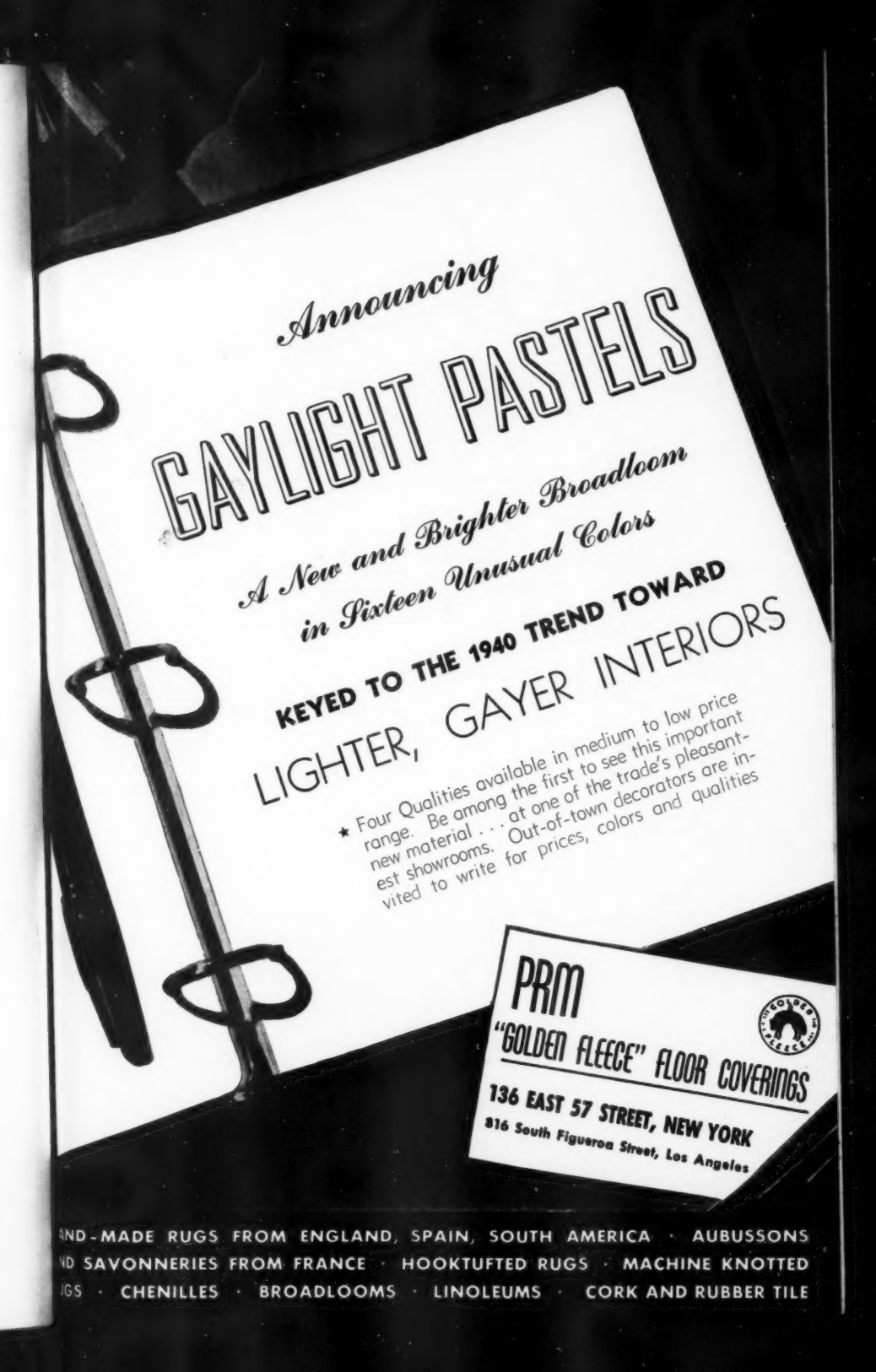
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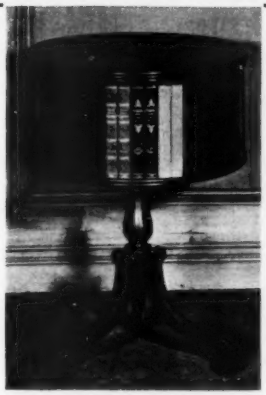

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RESEARCH IN THE PLASTICS INDUSTRY

Continued from page 68

in terms of economic needs. In my own thinking, I confine research to the limits of this last definition but for the purpose of this talk, perhaps it should be broadened to include also the development of the products of research up to a point where they become useful articles of commerce.

In order to do effective research, we must first of all know what to look for, what objective to reach. Let us ask ourselves these questions: What are the future needs of the plastics industry? What have been the trends of the past, and do they lead to the satisfaction of the needs of the future? What fundamental conditions must be met in order to satisfy the future needs?

Let us start by reviewing the past: I think it is safe to say that plastics have not created many, if any things entirely new but have been used to make articles which have been, or could be made of other structural materials, and make them better, cheaper, more attractive, more durable, lighter or stronger so a greater demand is created for the articles using plastics than using the previous materials. If these are the reasons for the success of plastics so far, then the extension of these factors to a higher degree, either by refinement of present materials, methods and processes, or by the discovering and development of new and better plastics should bring more success to the industry.

In the field of interior design the properties of plastics which have *promoted* their use are: color, texture of surface finish, translucency or transparency, lightness, strength, warmth to touch, versatility of form, and permanence of finish.

The factors which have *hindered* the use of plastics in this field are: High unit cost of plastic materials. Difficulty of fabrication when only a small number of pieces is made. Low softening point of thermo-plastic materials. Low scratch-hardness of glass-like plastics. Susceptibility of certain plastics to cold-flow under pressure and of certain others to change in shape on absorbing and giving up moisture.

Plastics research is concerned with both lists—to improve the good properties of the

Continued on page 76

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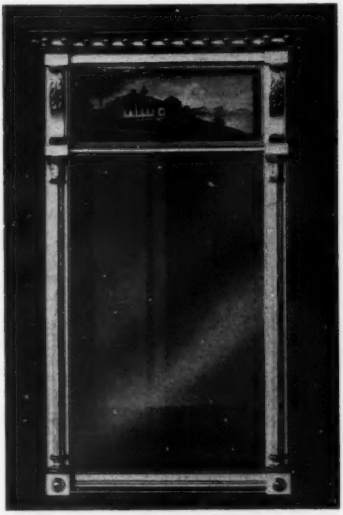

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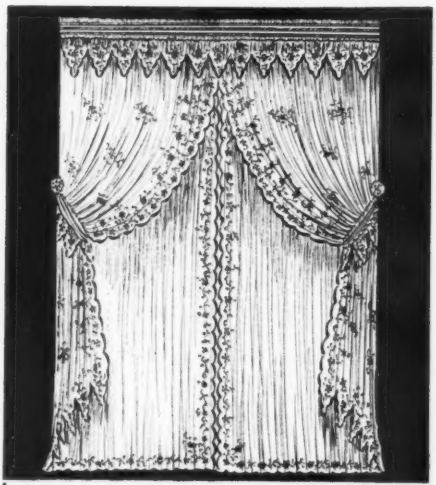

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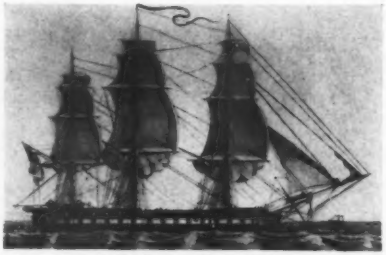

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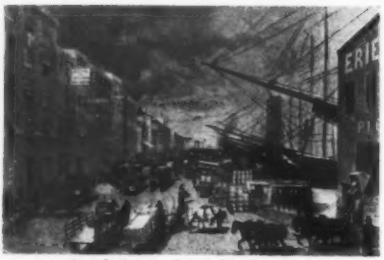

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RESEARCH IN THE PLASTICS INDUSTRY

Continued from page 74

present available plastics or discover new ones which are better; and to remove the obstacles in the same way. Probably the removal of the obstacles is the more direct way to increase the use of plastics.

What is research doing to bring this about? Let's take the obstacles one by one: *Cost*—is probably the most important factor in the expansion of plastics in interior design. Cost is made up of material, labor, and expense.

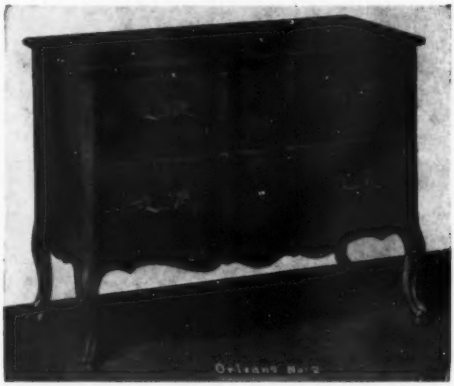
Our search for lower cost materials is for those which come from abundant sources and which can be developed into usable form with a minimum of expenditure. Most of our present organic plastics come from abundant raw materials such as coal, air, water, salt and energy. From these we get the elements from which organic plastics are built. These sources of material are abundant and cheap, so our problem is to improve the economy of synthesis. This usually calls for large volume production; and large volume production of the intermediates of which plastics are made means that there must be other large uses aside from plastics.

Now let us consider some of the existing plastics from this viewpoint. The best example of this is urea-formaldehyde resin, such as Beetle and Plaskon. Urea is made from ammonia and carbon-dioxide—both easily made, and abundant. And urea is widely used in agriculture as a fertilizer material—so it must be low-priced (about $100 a ton). Formaldehyde is made by the catalytic oxidation of methanol (wood alcohol), which is used in tremendous quantities as an anti-freeze liquid for automobile cooling systems. Potentially, urea-formaldehyde resins are among the lowest in cost, as far as raw materials are concerned. Research on the urea resins, therefore, should be directed to improving and simplifying the process of manufacture and control so the finished product can be sold profitably at lower and lower prices.

The phenolic plastics such as Bakelite and Durez are obtained as a by-product of coal tar or by synthesis starting with benzene. There isn't half enough phenol in coal

Continued on page 78

ENGLISH AND FRENCH REPRODUCTIONS



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RESEARCH IN THE PLASTICS INDUSTRY

Continued from page 76

tar to supply the plastics industry, so the remainder must be synthetic phenol. Benzene is plentiful and cheap enough so that most of what is produced in the United States is blended with gasoline for motor fuel, but the process of making phenol from benzene is rather difficult, and furthermore the other uses for phenol outside the plastics industry are relatively smaller than the uses of urea, so the price of phenol is about $240 a ton—compared to $100 for urea. The formaldehyde is the same. Actually phenolic compounds are lower in price than urea compounds because of greater volume and lower processing cost. Thus, in order that phenolic resins be still lower in cost the research should be directed toward cheaper ways of making phenol.

To cite another example, take the cellulose plastics-cellulose acetate, such as Lumarith and Tenite, and ethylcellulose—the cellulose is cheap and abundant, but the processing needs to be more economical to lower their cost. Also other esters of cellulose with improved properties have been developed and are coming into general use.

Polystyrene is made of abundant materials, but the high purity necessary to make a satisfactory plastic requires expensive processing. Here the research should be directed toward more economical processes or toward ways of stabilizing styrene so the high degree of purity is not necessary. Methyl methacrylate starts with acetone, which is relatively cheap, but the processing is expensive, involving several steps. Research, toward improving the process, should bring good results. Plastics based on vinyl chloride and vinyl acetate are potentially low in cost if made in sufficient quantity.

New lower cost resins and compounds from abundant sources of raw material are the object of wide research, and we can expect to add more new names to the list of plastics each year. Some of these may be derived from farm products. For example, surplus skim milk is a source of casein from which "Lanital" or synthetic wool can be made—and also of lactic acid,

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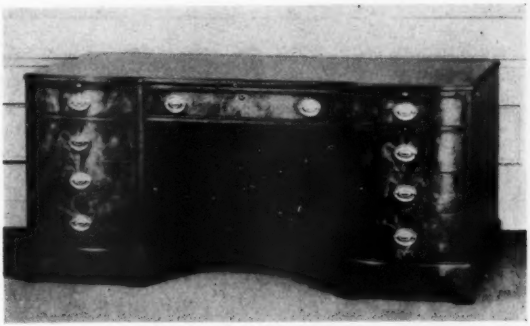

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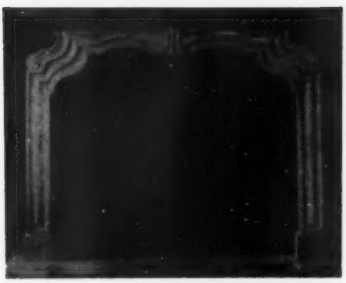

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RESEARCH IN THE PLASTICS INDUSTRY

Continued from page 78

from which may be derived ethyl acrylate. Much work has also been done on the development of ligno-cellulose plastics from wood chips, or from the woody portion of sugar-cane stalks (bagasse). Ligno-cellulose as a plastic is getting much attention from the paper industry. Another field of research is in fermentation of sugars.

Proteins from corn or soybeans have been studied and commercial plastics developed which are tough and horn-like, but which have a rather high moisture-absorption.

The Department of Agriculture has recently established four large Research Laboratories devoting their time to the development of industrial uses for farm products, and plastics are scheduled for considerable attention in their program. The petroleum industry also has shown that crude oil and natural gas are source of raw material for making formaldehyde, phenol, butadiene for synthetic rubber, glycerine for alkyd resins.

The primary value of all these researches to the plastics industry, is to provide it eventually with lower-cost molding materials. Other work is also being done with the molding processes and the molds to bring about lower costs. New automatic molding machines with high output have been developed for injection molding of thermo-plastics and compression molding of thermo-setting materials.

Improved methods of making molds are being developed. For individual castings of plastics, some advance has been made in the use of molds made of rubber or of rubber-like plastics, such as plasticized polyvinyl chloride. This has allowed the casting of complicated shapes which would never be removed from rigid molds and shortens the step from the clay model to the cast plastic reproduction of it. Thermo-plastic transparent materials, like cellulose acetate or methyl methacrylate, are made in sheet, tube, and rod form. These may be softened, formed, and cemented together. This is an attractive way to make custom built pieces. I mentioned that the low softening point of the thermo-plastic materials was a handicap. Those in commercial use all soften at temperatures around or below

Continued on page 82

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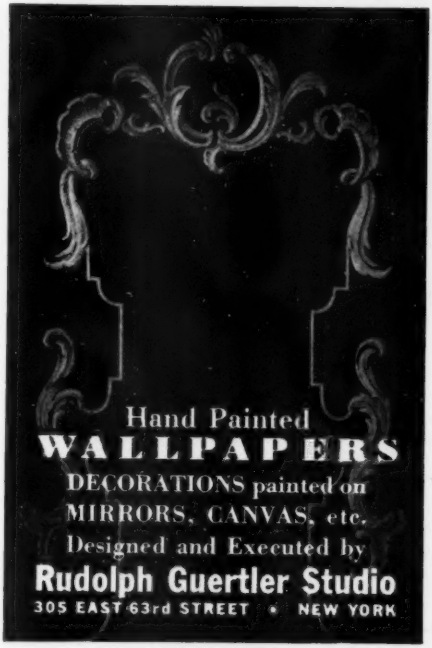

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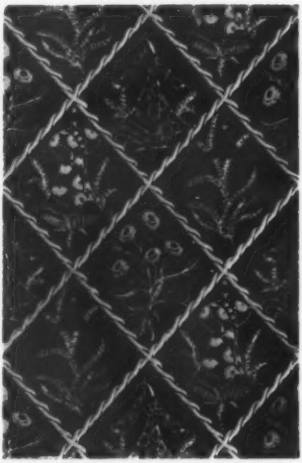

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RESEARCH IN THE PLASTICS INDUSTRY

Continued from page 80

100 degrees, Centigrade, but considerable research effort is being spent to raise the softening point to 125 or 150 degrees, Centigrade, and eliminate "cold-flow." Beyond this, I cannot predict just when such a material will appear commercially.

In general, the thermo-plastic materials have low scratch-hardness. On the other hand the thermo-setting plastics like the phenolics and ureas are quite hard and abrasion resistant, particularly the ureas. What we need is something which is formed as readily as a thermo-plastic, but which has the surface hardness of a urea-formaldehyde resin and is as clear as methyl methacrylate. So far, such a material has not shown itself, but we will not say it is impossible—although we may end up by getting the abrasion resistance by making the surface tough like rubber, instead of hard like glass.

In the past, there have been some objections to urea resins for their absorption of moisture, but this is being overcome and their stability greatly increased. Also, there are under development new light colored plastics with almost the range of color possibilities of the ureas but with the moisture stability of the phenolics.

Earlier I spoke of the fundamental properties of plastics which have promoted their use in interiors. Many plastics have been mentioned and all have combinations of several of these desirable properties.

While I have spoken mainly of plastics, this talk would not be complete without mention of resin-bonded plywood and synthetic resin finishes, because the same names are becoming common to all three of these fields. Phenolic and urea resins have been developed for hot and cold pressed plywood and the molding or forming of plywood structures will be developed and advanced strongly in the next few months. This combination is attractive and can be extended in the furniture field.

***EDITOR'S NOTE:** These addresses do not appear here in their entirety because of lack of space. A complete transcript of the Conference proceedings is available for $2.50. Please write to the Department of Plastics,* INTERIOR DESIGN AND DECORATION, *521 Fifth Avenue, New York City.*

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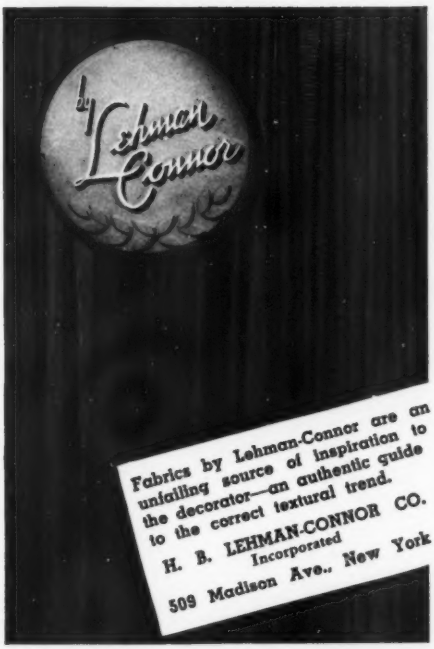
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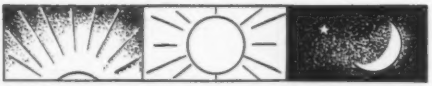

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STYLE SLANTS

Arthur J. Hoffman, who carries these fabrics, is now located in a larger showroom on the same floor of 515 Madison Ave.

There is a great treat in store for you at J. H. Thorp & Co. this season, for the new fabrics are just what you have long been searching for. A large print on faille of the most delectable colored ostrich feathers is matched to a taffeta plaid, picking up the same shades. Gray-blue, maroon and yellow are but three of the stunning colors which have been combined, and you can find innumerable uses for the plaids alone; there are at least six color combinations of each. Another exciting addition here is the *Americana Group* printed on cotton with all the imperfections of the antique examples they are taken from. Color is inspired from old glass bottles, a rural red barn or the popular thyme green and putty color used many years ago.

A new yarn, used by F. Schumacher & Co., produces still another textural effect—there seems to be no end to them! This one has a tobacco leaf motif forming a wide, graceful stripe. A figured matelassé has delicate floral sprays and the colors are superb! A heavy satin has alternating stripes of a small leaf and a plain stripe; in a Rococco design an embroidered effect is applied to a quilted ground. In vogue with the loose swag chenille, a heavy cotton fabric has the same effect in dark blue applied to a natural ground; the stripes between are touched with bright yellow.

At E. C. Carter & Son, you will find Swiss embroidered muslins, either by the yard or in two, two-and-a-half or three yard curtain lengths which are still extremely popular for they will fit well with Early American, French provincial or other less formal interiors. Also, in addition to their being used at windows, you will find them most attractive when made into dressing table skirts or for four-post, tester beds.

The new fabrics from Scalamandré Silks are all designed for your discriminating use, and are bound to help you create many individual schemes. On a natural ground an all-over design is embroidered in multi-colored wool of deep, mellow tones. There is a new damask here, one shade of which you will like in particular—a dull, red-rust tone; a small stripe is made in four com-

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plementary colors and a small red-and-white candy stripe as well as one in pink combines shades of green, and is printed on sateen.

Organdy, muslin, batiste and other materials embroidered in self colors have proved very popular with Richard E. Thibaut, as well as French tambour, finished panels and embroidered reproduction French and Swiss nets with scalloped edges. A chintz, with morning glory pattern has a wide contrasting stripe in the background and there are any number of interesting rough textural materials which will be well received.

The *Glo-Vel* line of Collins and Aikman Corp. is truly named, for its iridescent sheen and gloss are subtle and will appeal to you for curtains as well as upholstery. One of the new patterns for this new year is a crushed effect achieved by an uneven spacing of the pile; another is an all-over fern tracery and the other three are equally as appealing — all being Jacquard weaves.

There is additional interest in the fabrics carried by Arthur H. Lee & Sons for most of them have a historical story attached that will add greatly to their charm. A large chintz pattern, taken from blocks made ninety years ago, is enlarged in scale and reproduced in four colors; another multicolored glazed chintz is printed on an oyster-white ground. One striking example, adapted from the Early Victorian, has a draped swag and fringe motif which outline small vignettes showing a palace dome; curled plumes also add to the effect.

You will be won completely by the new additions at Lehman-Connor, Inc. for they are a treat just to view! There is a series of twelve hand-blocked glazed chintz patterns from blocks eighty years old, and every one just as charming as you could hope for. A reproduction taken from a Swedish tapestry has small floral bouquets on a strié background and comes in four soft color combinations. All the true Empire colors are included in an upholstery damask with a typical small design, and a new pure silk damask is surprisingly inexpensive! The brilliant, exotic note is struck by several Polynesian designs of gourds, birds of Paradise, schooners and South Sea Island flowers, printed by hand.

You may have used the large-scaled designs printed on heavy cotton, but have you

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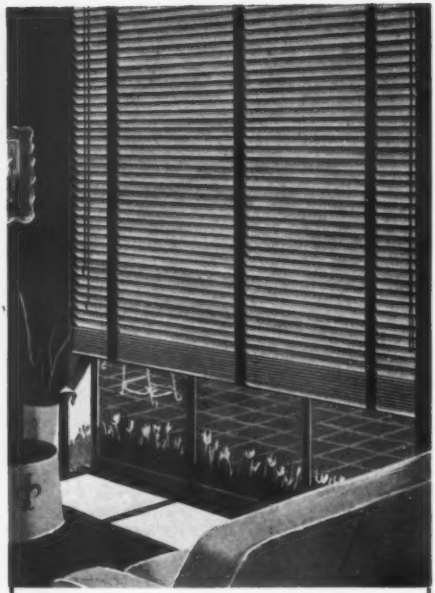

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realized the added attractiveness of them when they are quilted? Stroheim & Romann carry a chrysanthemum stripe in a wide width and one of the same type in a narnow, inexpensive English print. Another reasonably priced rep cloth is sunfast, has a good variety of colors and the design well scaled. A heavy cotton, similar to sail cloth, has a pastel floral stripe, and here again, both design and color are enhanced by quilting. An English material, partly linen, has a pattern composed of bunches of tulips caught with a bow-knot of ribbon.

On a double-warp cloth, Johnson & Faulkner have produced several excitingly different designs, bound to delight and charm you. Feathery palm trees surround small vignettes on one; ships and seascapes are on another; and one of the color harmonies which will tantalize you is composed of coral, chartreuse and gray. A typical English chintz of vines and floral bouquets includes the exact colors of the original as well as the more Modern ones, and it also comes on the double-warp cloth.

When mentioning fabrics from L. C. Chase & Co., *Velmo* is one of the first names to come to mind. There are several new styles in these attractive mohair velvets, but perhaps the most important feature is the colors which are more delicate and subtle than ever before—corn yellow and rosy tones among them. In the deeper colors, peacock blue and mulberry are in evidence.

There is a great demand for finely embroidered muslins, organdies, batistes and other thin materials, and when the imported ones cannot be procured, Steiner Studios is repeatedly called upon to reproduce them and also copy the designs of old ones which a client has treasured for many years. All these have been embroidered for use as bedspreads appealing to the more feminine taste; for glass curtains or dressing tables.

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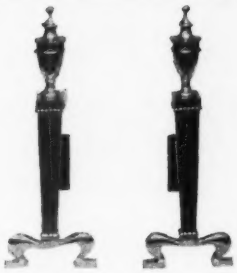

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